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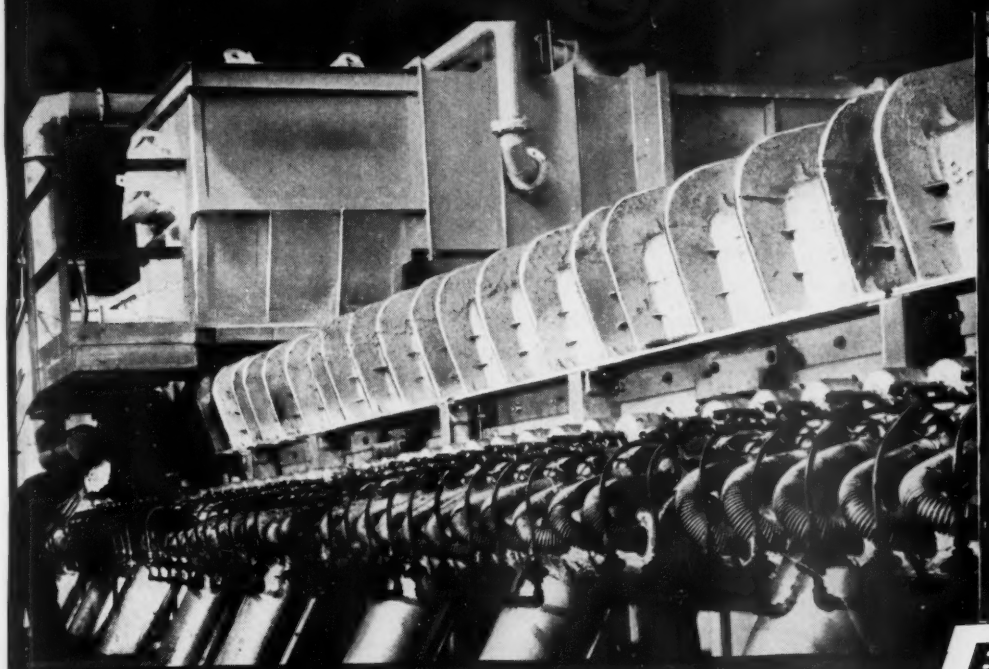

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Push the "Fancy Goods"!

Many years ago, in the days before the self-serve supermarket, I worked for some time at a grocery store in the home town. For the size of the town, that store enjoyed an excellent volume of business and employed six clerks. The owner, an excellent merchandiser who also traveled part time for a wholesale grocery concern, spent a great deal of time and effort in trying to improve the service which his employees provided for the customers.

Looking back on that experience, I can see that the clerks in the establishment could have been divided roughly into two classes—namely, those who were quite content to sell sugar, flour, potatoes and such bulk commodities, and those who listened to the pleadings of the owner and also tried to create customer interest in the "fancy goods." Of course, profit was short on sugar, and no salesmanship was required to move that commodity, while profit was long on the fancy goods but an interest in the likes and dislikes of the customer was necessary to make the sale. Sorry to relate, the factor of profit made little difference to those clerks who preferred to sell sugar.

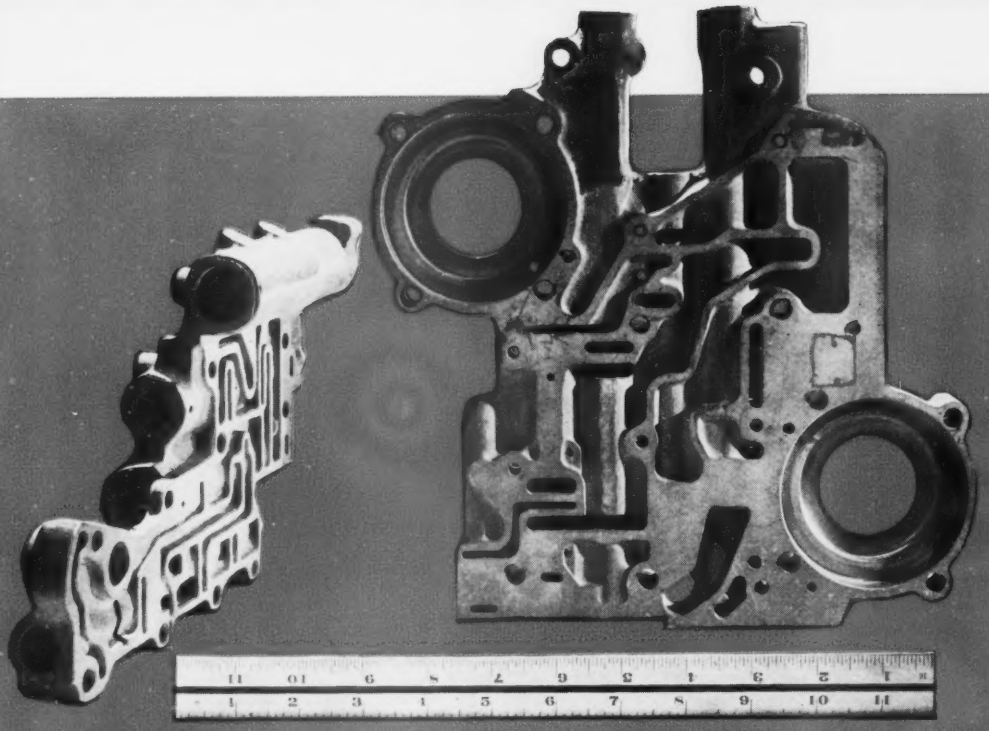
Considering the sales efforts of the foundry industry today, I am convinced there are too many of the "sugar" type salesmen trying to sell castings. These men have the conception that castings are just bulk materials to be sold by the pound. They have no particular interest in the ultimate use and service potential of the castings as long as their price is low enough to get the patterns. Because they sell almost entirely on price, their companies frequently show an unsatisfactory profit record.

On the other hand, there are many "fancy goods" salesmen in the foundry industry. These men have a basic knowledge of castings' properties and potentials. They are trained to consider a casting as an individual component that performs a special function in a particular application. These salesmen constantly are examining products of customers and prospects to see where castings can be substituted for parts made by other methods of fabrication. They base this sales effort on providing a better part at a competitive price. They understand how to redesign castings for improved manufacture, better service or lower cost. In other words, they are constantly ferreting out new applications for castings, thus providing excellent and welcomed service to customers and, at the same time, enlarging the market for castings.

Let's train more castings salesmen on the "fancy goods" approach.

Frank G. Steinebach

Editor



At left and below are several representative aluminum castings made by the Antioch process. They give an indication of the severe demands placed upon the process in producing castings with high degrees of precision for use in various special applications

The Antioch Process for Making—

Intricate Plaster Mold Castings

After years of research and experimentation, casting process has been refined to produce accurate, intricate, pressure-tight, high-strength, surface-smooth castings that do not require machining

By KENNETH L. MOUNTAIN
Associate Editor

THE Antioch process of casting metal had its beginning in 1926 on the Yellow Springs, O., campus of Antioch College. Its present commercial development resulted from experiments with "lost wax" in casting bronze statuary and art objects.

Originally a college-owned, student-managed project located in an old barn on the edge of the campus, the operation grew after years of hard work on the part of Mr. and Mrs. Morris Bean and their associates. During the 30's they quietly carried on research and development work which has resulted in successful methods of making intricate castings meeting unusual requirements.

As research grants were received from large industrial concerns, the business outgrew its capital and its facilities. General Motors Corp. bought the foundry from the college in 1940 and constructed a brick building adjacent to the original cow barn. As the building was on the campus, the college owned it and leased it to GM. During World War II the foundry operated as part of Delco-Remy Division, General Motors Corp., producing aluminum cylinder heads for Allison aircraft engines.

As the war ended, the Beans and their associates decided to buy the foundry from GM and establish an independent, locally-owned, locally-managed, small community business. In 1946 the Antioch Foundry became Morris Bean & Co. Business continued with the property being rented from the college while a new plant was under construction. In September, 1950 the company moved into a new, modern building located 2 miles south of the Antioch campus.

The building contains about 110,000 sq ft and nestles among the rolling hills of southern Ohio. Wooded pastureland and cornfields still dominate the landscape. The site covers 60 acres and provides ample employee parking and recreational space. An artificial lake is in the rear of the plant and, while originally intended for water supply, it is used currently only for standby purposes as sufficient water is available from other sources.

About 500 employees make up the payroll, 400 of these being production workers. Present output is 250,000 lb monthly, mostly aluminum, and turned out by two shifts working a 42-hour week.

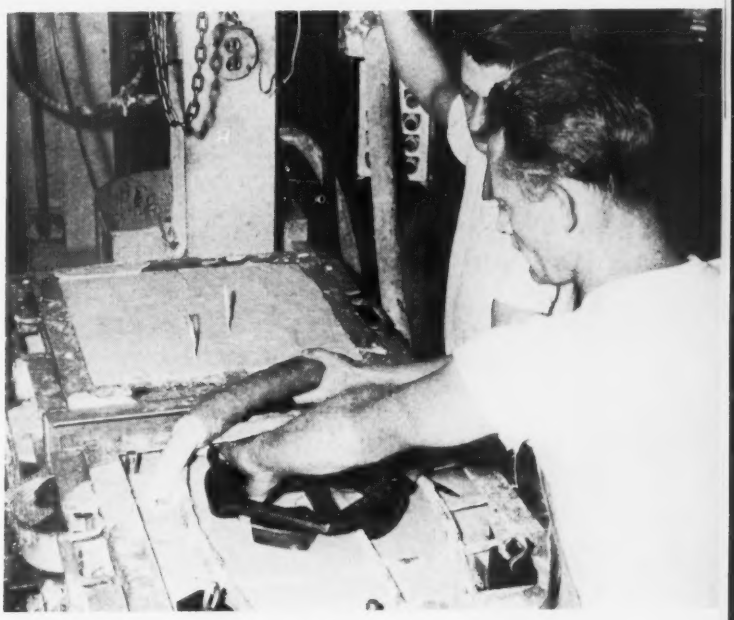
A variety of castings are produced for fluid flow, microwave, aircraft, automotive and special military applications. Impellers, heavy-duty torque converters, tire molds, propellers, diffusers, guided missile fuel pumps, wave guide components, magneto housings, brakes, and aircraft engine supercharger inducers are among the major castings made. Castings find ready acceptance because they meet high standards of metallurgical quality, pressure tightness, dimensional accuracy, intricacy of design, surface smoothness and sharpness of surface detail.

Close Tolerances Held—Tolerances of ± 0.003 and surface finish better than 63 microinches as cast are being obtained on small feed horns. Tire molds for passenger car tires, containing hundreds of stainless steel inserts which form complex tread patterns to eliminate harmonics, have been held to ± 0.015 on 30 in. ID. Tire tread molds at these tolerances have been cast weighing as much as 1000 lb, as well as lawnmower tire molds weighing less than 3 lb.

To hold these dimensional tolerances, it is obvious that the molds must be free from distortion. In years of research and development, it was noted that if the molds formed by the setting slurry were allowed to rehydrate without being disturbed, gypsum crystals would re-form throughout the interior of the mold mass in grains similar in size to grains of sand. These grains have sufficient intergranular strength at point of contact so that the mass retains its shape, yet it acquires a high permeability to gases.

This transformation does not take place on the surface of the mold as not enough water is present. Surface remains smooth while the interior becomes granular and permeable. Permeabilities obtained in this way can be made to range from AFS 15-150. In practice, permeability is held within the range of AFS 25-75.

These results are obtained by controlling the chemical transformations between the hydrates of

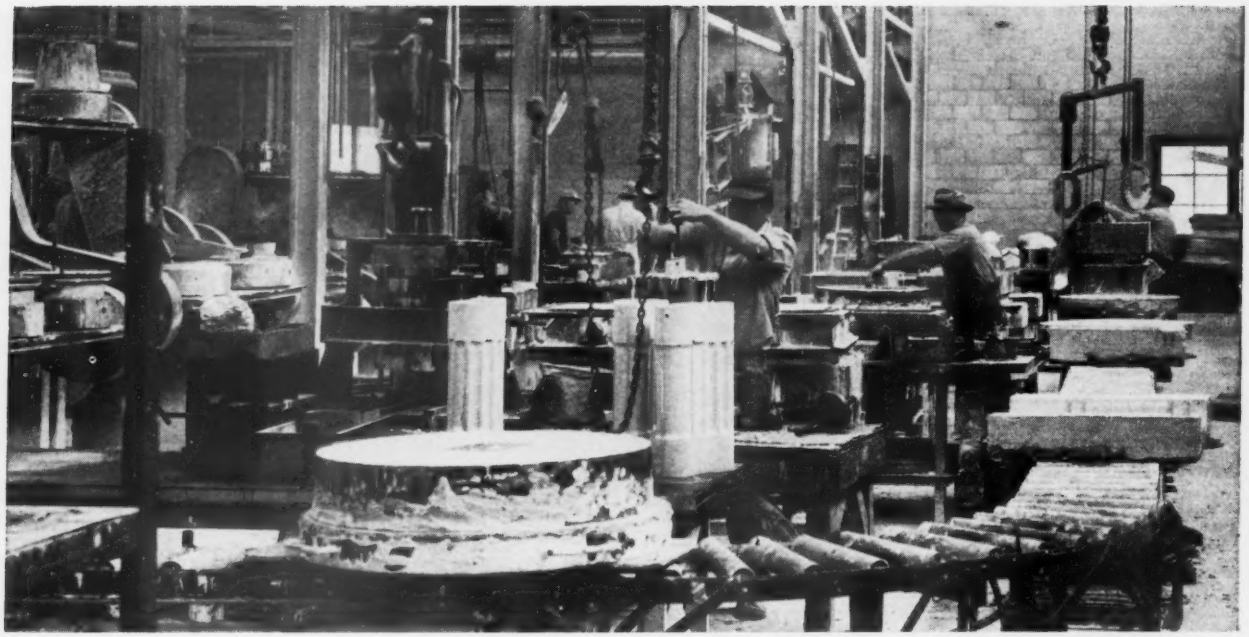


Since slurry is free-flowing and rapid-setting, as many chills or cores as needed can be used

calcium sulphate (gypsum being the dehydrate form of this salt). To the half hydrate ($CaSO_4 \cdot \frac{1}{2}H_2O$) free water is added to form a slurry which sets to a solid in 4 to 7 minutes.

To have free water available for the hydration to granular form, the green mold is dehydrated in an autoclave. Upon removal from the autoclave, the dehydrated molds stand at room temperature and the half hydrate slowly hydrates again by combining with the free water to the dehydrate form. In so doing, the interior becomes granular.

Mold is then dried at elevated temperatures to



Conveyorized slurry pouring station can handle as many as 35 to 40 different jobs simultaneously. Molds on conveyor are moving toward a take-off station

remove all the free water and most of the chemically combined water in the calcium sulphate. Additions of 50 mesh sand up to 50 per cent by weight in no way interfere with transformation of the mold structure into permeable form.

During the dehydrating and rehydrating process, small additions of sodium silicates and portland cement keep the expansion of the mold under control. Between 0.001 and 0.0025 in. linear expansion per in. is allowed for this expansion. It causes less variation in final casting dimensions than do variations in metal shrinkage.

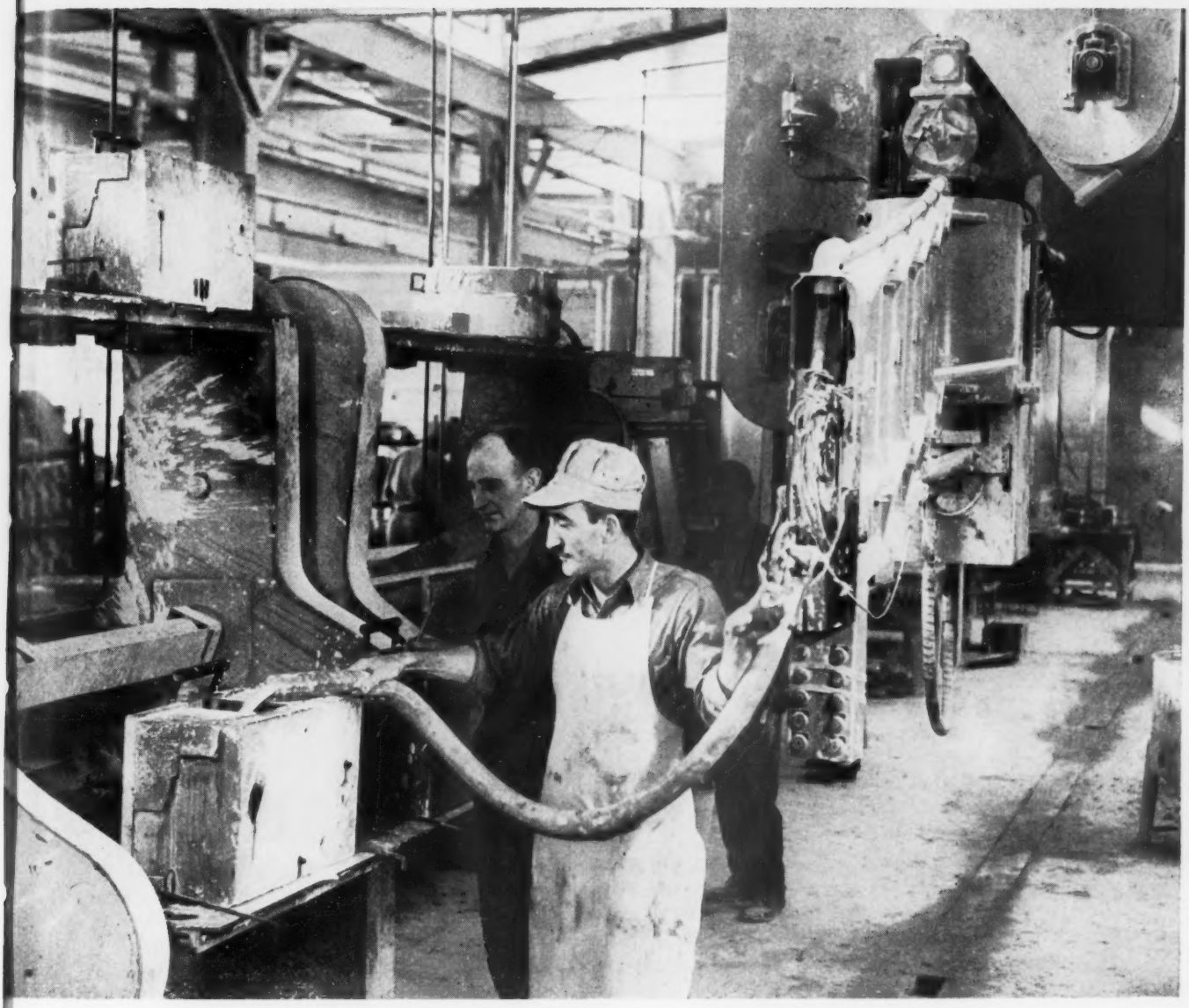
Flexible rubber patterns are anchored to rigid backs and have complete recovery after flexing

Preparing the Mold Mixture—Dry mold material is about 50 per cent washed silica sand, 40 per cent gypsum cement, 8 per cent talc and small amounts of sodium silicate, portland cement and terra alba. Dry ingredients are mixed with water, about 50 parts of water to 100 parts of dry material by weight. The mixture is extremely fluid and free-flowing, being about the consistency of mushroom soup. It is accelerated to set in 4 to 7 minutes (time required between mixing the slurry and removal of molds and/or cores from the pattern).

As the process uses a liquid slurry with an average set strength of 70 psi and dimensional stability properties, it is possible to set as many or as few chills as desirable anywhere on a pattern or in a corebox. There is no problem of getting mold material around the chills. Mold stability prevents cracking of mold or dislocating of chills during processing.

Often the chills used are equal to or heavier than the weight of the casting being poured. The heat sink provided by the chills often approaches a permanent mold operation. Chills are used on almost all castings to aid in establishing temperature gradients needed to assure complete feeding and freedom from shrinkage.

In actual practice at Morris Bean & Co.'s new plant, the dry mold material is premixed in large bins and transported through overhead pipes to storage hoppers which are integral parts of specially-built mixing machines. These machines mix water with the dry ingredients and deliver the slurry through a hose into metal boxes for forming molds or cores. An operator controls the amount of slurry mixed and delivered so there is no waste of material that might occur as excess



Slurry is discharged through hose into mold from a specially-built mixing machine. Operator controls amount of slurry mixed and delivered to avoid waste

in the more common procedure of batch mixing.

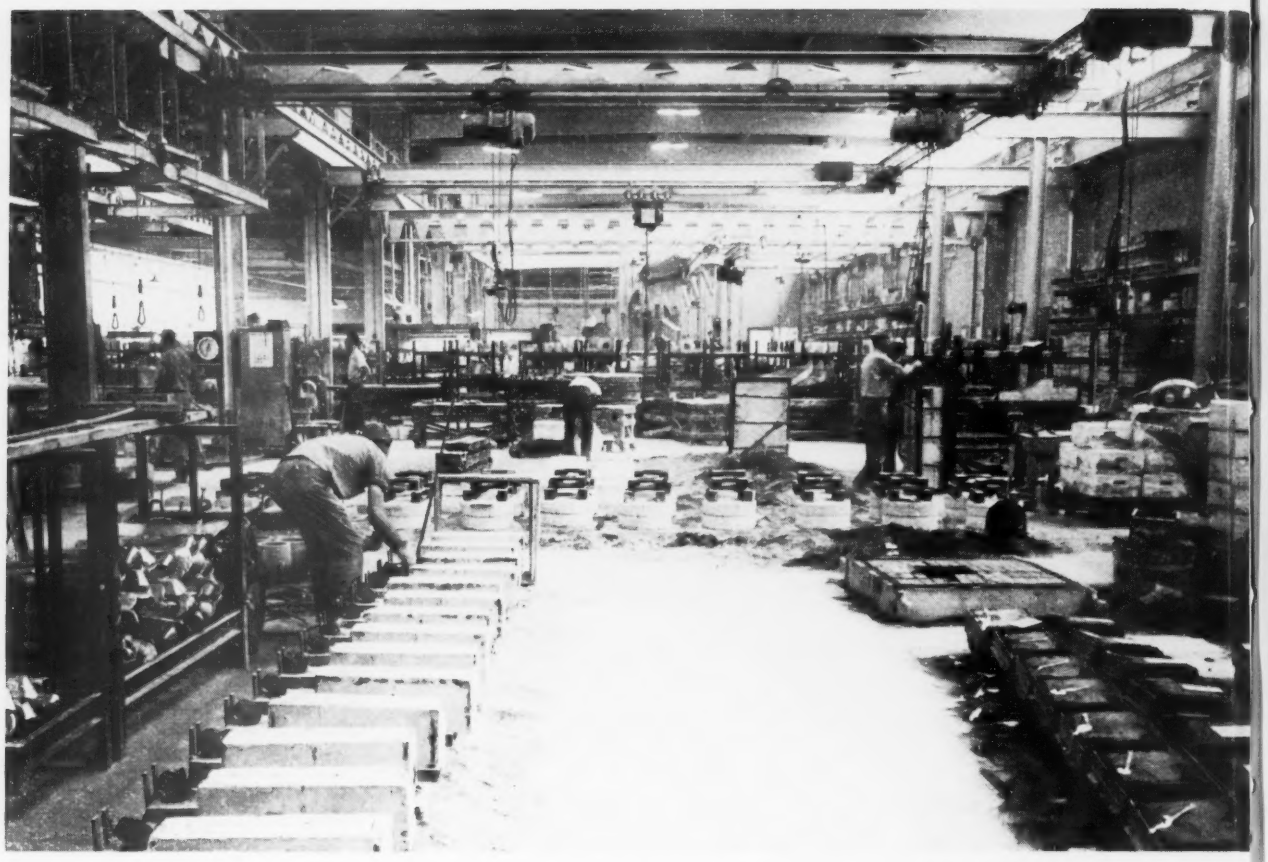
Seven mixing machines, three at permanent stations and four that move on overhead rails, service several mold production units. Generally, each unit is producing either complete molds or mold components in a variety of sizes, shapes and complexities.

There are several slurry pouring stations, flexible in arrangement and designed to accommodate a variety of work in process. The central station is a unique conveyorized, rectangular-shaped unit about 60 ft long x 25 ft wide, with work stations available to handle as many as 35 to 40 different jobs simultaneously. Small pattern boxes are cleaned with soap solution, air blown, chills set properly, box locked and placed on a specially-designed revolving table that carries the completed assembly to the inside of the unit where slurry is poured. Pattern box stands until the slurry sets, then revolves back to the worker, is removed to a bottom board on the conveyor and continues to a take-off station.

Within the slurry pouring station large pattern sections are cleaned in the same manner, then assembled; chills are set, the box locked and slurry is poured while the assembly is on a specially-built mold table. Upon setting, the green mold is separated from the pattern automatically by hydraulic action from underneath the table. Chain hoists then carry the molds to the conveyor where they are placed on bottom boards and conveyed to the take-off station.

In these various slurry pouring stations, automatic mixing and discharging slurry machines are used so that rapidly accelerated sets can be obtained. As a large proportion of 50 mesh sand is in the mix to improve the heat capacity, it is essential that the slurry set quickly before either the water or sand particles have a chance to separate. This accelerated set is vital to obtaining a uniform surface of high strength, as well as rapid turnover of patterns.

Flexible Patterns for Tire Molds—In tire molds, flexible patterns are used. They are made of a



Molds are poured on floor and on short-length conveyor lines. In this pouring bay, metal is transported from furnaces in ladles suspended from chain hoists

vinyl chloride or Thiokol rubber compound, anchored to a rigid back so they are always held in exactly the same position. These pattern materials have a complete recovery after many flexings, are waterproof and release easily from the mold after it has set.

These patterns can be withdrawn from a rigid mold even though it has undercuts which would prevent withdrawal of a rigid pattern of the same design. Flexible patterns can be used because the mold material first flows over the pattern as a liquid and because it sets to a solid strong and rigid enough to be withdrawn without damage or distortion.

At the take-off stations, molds are removed from the conveyor and inspected. Acceptable pieces are placed on tiered racks. Combinations of mold components making up a complete mold are kept together on the same racks to avoid rehandling during processing.

Racks are moved to an adjacent department containing three large autoclaves and 12 batch-type ovens. Green molds are placed in the autoclaves for an average of 6-8 hours at 15-17 lb gage pressure to dehydrate the mold. Racks are removed from the autoclave and allowed to stand at room temperature for a minimum of 14-15 hours while the internal granular structure of the mold is changing.

Molds are dried in the batch-type ovens. Average length of stay in the ovens is 25-30 hours at a temperature of 450-475° F. Some molds remain in the ovens for as long as 50 hours. This heating at elevated temperatures removes all of the free water and most of the chemically combined water in the calcium sulphate for reasons described earlier.

Mold racks are moved to a central storage or ready room where they are kept warm and dry. At least a three-day inventory of molds and mold components is kept in this room in advance of pouring so there will be no delays in production. A mold bookkeeper keeps accurate records of each piece in the ready room and is able to supply without delay any component when needed for any job being poured.

As production schedules dictate, molds are removed from the ready room for assembly preparatory to pouring. Some molds contain as many as 60 parts. Certain molds are assembled on specially-designed chill tables consisting of a base of flat, machined metal plate with connecting water lines. As metal is poured into the mold, the plate is sprayed with water to increase the cooling rate of the metal, provide a faster freeze and give better metallic quality to the casting.

Pouring is done both on the floor and on short-length conveyor lines, depending upon the number and type of molds involved. Metal is poured from small-capacity tilting ladles operated by two-man crews. Ladles are suspended from conveyorized chain hoists that traverse the melting-pouring areas.

Metal is melted in 1000 lb-capacity gas- and oil-fired tilting furnaces. Fourteen furnaces are used,

Three autoclaves (right) and twelve batch-type ovens (left) play vital role in mold processing

Assembling tire mold components. Note number of chills that have been set into one mold segment

Pouring metal into a mold assembled on a water-cooled chill table that provides a fast freeze

arranged in batteries of six and eight in two separate locations. Furnaces are of standard manufacture but rebuilt with larger mountings and jackets to meet specific requirements. Commercially available standard aluminum alloys provide metal for casting. Sprues, scrap and rejected castings are returned to the melting department for reuse.

Nitrogen Degasses Metal—As standard melting practice, nitrogen is bubbled through the melt just prior to pouring to aid in eliminating dispersed porosity in the metal. Rapid solidification also helps eliminate this type of porosity and again the use of chills aids in creating a heat sink that produces porosity-free castings.

Before pouring, temperature checks are made with immersion thermocouples. Metal is poured within 10° of the established pouring temperature. In melting complex castings, metal temperature is critical and pourers have learned from experience that metal poured at improper temperatures sacrifices quality and increases scrap.

For every heat of metal melted a test flat is poured consisting of a chill at one end and a riser at the other. This is used for radiographic evaluation of metal degassing. For every heat a frame of six test bars is made which follows that metal through processing and is shipped with the casting to the customer.

Before each melt is poured, the gas level is checked by allowing a small metal sample to solidify under vacuum. Actual practice provides a sound correlation between vacuum check and test slab x-rays, but if the gas level in the melt is too high the melt is not poured but is held back and re-treated.

As the separation of the casting from the mold at the interface is clean and complete, there is no mold material adhering to the casting. Mold material is broken away and removed to an outside storage area. On castings that contain intricate vanes, complex passageways or contoured blades, a liquid knockout system is used to avoid damage that might result from conventional mechanical shakeout.

In the shakeout and knockout department, castings are inspected, degated, and rough ground before being sent to the finishing department. Sprues are segregated and returned for remelting. Chills are accumulated and cleaned before returning to the slurry pouring stations for assortment and reuse.

Close Inspection Provided—Each casting gets individual final inspection before shipment. X-ray

During production each casting gets individual final inspection before shipment. Many castings undergo special tests that probe into desired special properties. As standard practice, all castings are under continuous inspection at every stage of each operation to maintain dimensions and tolerances that are essential in the end-use of each casting

and Zyglo equipment is used as part of the inspection procedure. Many castings undergo special tests to check for pressure tightness, hardness, tensile strength, elongation and resistance to fracture while spinning. In addition, while castings are in process, they are under continuous inspection at each operation. Employees are reminded continually that maintaining dimensions and tolerances is vital and that process controls are more important than the process.

Each department has an inspector who is not responsible to the department supervisor but who reports directly to the head of quality control. This assures that at each processing stage, material that is below standard is rejected. If excessive rejections occur, the quality control supervisors immediately seek to isolate the trouble and take corrective action.

Six gas-fired circulating-air heat treating furnaces are available for those castings that require heat treatment. Castings get varying degrees of heat treating depending upon alloy content, size, end use and other factors. The heat treat equipment meets Army and Navy specifications for treatment of castings used in military and other governmental applications.

Good patternmaking contributes greatly in extending the capabilities of the Antioch process in producing intricate and difficult castings. A modern, well-equipped pattern department is maintained for work on both production and experimental patterns. Finishing department contains all the necessary machine tools and accessory equipment to perform any machining operations that are required.

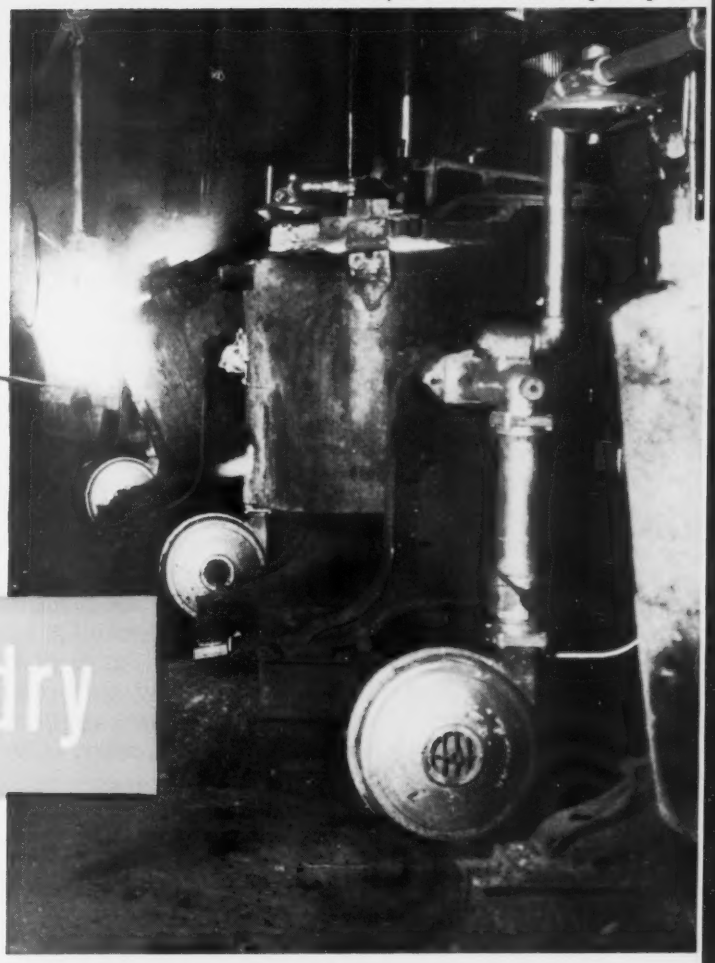
Morris Bean & Co. are the first to admit that the Antioch process has its limitations and does not have universal casting application—that its basic mold materials are somewhat more expensive than sand and the processing cycle is more complex than conventional molding. But they are carrying on a continuing research effort to improve the economic limitations of the process. In the future many, if not all, phases of present Antioch practice will be replaced by new developments presently being studied.

Until then, however, the process does fill a need in providing accurate, intricate, pressure-tight high-strength and surface-smooth castings not requiring machining. Cost of the high degrees of precision inherent in the Antioch process is more than offset by the cost of machining otherwise required to achieve like results.

By HARRY ST. JOHN
Foundry Consultant

Melting Practice in The Brass Foundry

Photo courtesy of Stroman Furnace & Engineering Co.



Large crucibles in tilting furnaces should be scrapped when their useful life is nearly over

Last month, in the third article in his series on The Brass Foundry, the author discussed brass melting furnaces. This section takes up a related subject, brass melting practice

IN ANY FOUNDRY the management of the melting furnaces needs to be closely correlated with that of the molding floor. The molding department depends upon the furnaces for good metal, at the right time and in the right quantity, at a temperature suitable for the work in hand. When this is coupled with good working conditions and the lowest operating cost of which the furnace is capable, we have the best possible melting practice.

During melting some loss of desirable elements, particularly zinc, necessarily occurs. This loss may vary from less than one-half of 1 per cent to 6 per cent or more, depending upon the composition of the alloy, the type of furnace used and the melting practice. If care is taken to replace the loss, there is no impairment of metal quality, although the need for replacement does result in an operating expense.

How Metal Quality Suffers—The quality of the metal can suffer during melting as a result of picking up undesirable impurities from a number of possible sources. From the time metal is charged until it is poured it is in intimate contact with several or all of the following:

1. The furnace atmosphere.
2. The refractory substance of the crucible or furnace lining, including materials which may have been introduced for patching purposes.
3. Foreign materials incidentally mixed with the metal charge.
4. Fluxes or other reactive substances purposely added to the melt or accidentally present.

In fuel-fired furnaces the atmosphere is of prime importance because there necessarily exists a constant flow of combustion gases through the melting chamber, more or less in contact with the metal. When solid fuel is used, these gases are strongly oxidizing since an excess of oxygen is essential to efficient combustion and the attainment of a high temperature. To avoid serious oxidation it has been a traditional practice to cover the metal in a crucible with dry charcoal. During the superheating period, after the metal is all in the crucible and mostly melted, a crucible cover made from the bottom of a worn out crucible will help to protect the melt from contact with oxidizing gases.

In crucible furnaces fired with oil or gas the use of charcoal is unnecessary and even undesirable. Fuel and air are mixed in proper proportions at the burner and efficient combustion can be maintained without any great excess of oxygen. In fact, the danger now is that there may be too little oxygen and the metal may be exposed to a reducing atmosphere of unburned fuel and water

vapor which usually results in gassy metal.

Whatever difference of opinion there may be as to the effect of different furnace atmospheres on the red brasses and bronzes—and there are varying opinions—it is agreed that in fuel-fired furnaces the atmosphere should be at least slightly oxidizing. One-tenth of 1 per cent excess oxygen in the combustion gases represents the minimum of safety. Otherwise the result will be castings affected with gas porosity. If the oxygen content exceeds one-half of 1 per cent, there will be more oxidation of the metal than need be and the metal loss will begin to climb. Obviously the need for such close control means careful regulation of the fuel and air input and frequent checking of the combustion gases.

Flame Appearance a Clue — Actually a good operator can tell pretty closely from the appearance of the flame if his fuel-air ratio is within the desired limits. This holds good for all fuel-fired furnaces, whether crucible or direct-flame. A lazy yellow flame is definitely reducing; a short intense bluish-green flame is probably too oxidizing. Between the two, a moderately long flame, without a trace of yellow and not too noisy, is just right.

Even if the operator is competent other checks are advisable. An inexpensive Orsat apparatus, with a little experience in its use, tells the story quickly. A time-honored test is to hold a piece of zinc in the flame. If it turns black the flame is reducing: a straw color indicates an oxidizing flame but doesn't tell just how oxidizing it may be. When the metal is nearly ready to pour, a skimming rod may be used to pull back the surface scum. Momentarily the metal will look like quicksilver. If it films over almost instantly, the atmosphere is highly oxidizing. If it films over slowly, a moderately oxidizing condition exists. If it continues to be silvery, the atmosphere is reducing. But if you want to be sure you're right, use the Orsat.

One more precaution is advisable when oil is used—the sulphur content of the oil should be low. Metallic sulphides or dissolved sulphur dioxide gas can be responsible for casting defects.

In electric furnaces one does not have to deal with a stream of combustion gases. The atmosphere is essentially stagnant. Thus it becomes possible, theoretically at least, to melt under a neutral atmosphere with no oxidation of the metal and no contamination from reducing gases. The stagnant atmosphere also accounts for the low metal loss experienced in electric melting, since vaporized zinc lies like a blanket over the surface of the melt instead of being constantly carried away with the combustion gases.

Use of Charcoal Cover—In the low-frequency induction furnace it is common practice to cover the surface of the melt with a layer of dry charcoal. This quickly exhausts the oxygen from the air in the melting chamber and also serves to prevent freezing around the edge of the bath. The atmosphere thus stabilized consists of nitrogen, carbon dioxide and carbon monoxide, none of which is injurious to the brasses and bronzes. In the high-frequency induction furnace a charcoal cover is impractical because of the manner in which the molten metal piles up in a peak at the center of the bath. In effect the atmosphere is mildly oxidizing unless the melting chamber is enclosed and filled with a special atmosphere. Nitrogen is sometimes used for this purpose.

Knowing when metal is hot enough to pour is a matter which requires considerable skill. If poured too cold, it is useless. If it is too hot when poured, both time and fuel are wasted and the metal itself may be damaged

Charcoal serves no useful purpose in the indirect-arc furnace since the oxygen in the melting chamber is quickly converted to carbon monoxide by contact with the hot graphite electrodes. This, with the residual nitrogen, makes up the atmosphere of the melting chamber. A small vent is left at the furnace spout to relieve the pressure of zinc vapor which would otherwise build up within the furnace. The holes through which the electrodes enter the furnace should be close fitting and kept in repair to avoid the entrance of air. The deliberate admission of air, through tubes installed for that purpose, has serious disadvantages and, although practiced in some foundries, is of no benefit provided the melting technique is otherwise correct.

Air in Indirect-Arc Furnace—Since the use of air in the indirect-arc furnace has been strongly advocated by some users of the furnace, it seems necessary to discuss its advantages and disadvantages in some detail. There are two serious disadvantages. Air in contact with the melt results in some oxidation of the metal and also causes a draft through the furnace which carries out of the spout zinc which would be saved if the atmosphere were kept completely stagnant. These conditions combine to increase the metal loss above the desirable minimum of which the furnace is capable.

Almost as important is the increased consump-

Photo courtesy of Campbell-Hausfeld Co.

tion of electrodes due to continuing contact with air. Electrodes are expensive. The only purpose of adding air is to correct a reducing condition. Nitrogen, of course, is not reducing and it has been established that carbon monoxide, although reducing to pure copper, is not reducing to the copper-base alloys. At times water vapor may be present, emanating from an incompletely dried lining. This happens infrequently and can better be corrected in other ways. A more troublesome reducing condition which may need correction is the presence of finely divided carbon in contact with the metal. Carbon may be deposited as the result of oil or other carbonaceous material in the charge, or from flaking of the electrodes. Both of these conditions can be avoided and it is essential that they be avoided.

Electrodes of good quality will not flake if the arc voltage is such as to give a clear, free-burning arc. A yellow flame or any sign of black smoke from the furnace spout is an indication of trouble. It is important that the furnace transformer taps controlling voltage and reactance be adjusted to give a steady, free-burning arc. If the power company's line voltage is below its rated value, it may not be possible to compensate for this deficiency. This is something to investigate before a furnace installation is made. If voltage conditions are right, it is only necessary to make sure that the electrodes are of the top-grade quality which nonferrous melting in the indirect-arc furnace requires.

Carbonaceous Material Troublesome—Carbonaceous material in the charge is a matter of concern in any melting furnace. The usual trouble is with turnings wet with oil or cutting compound. In an open-flame furnace, oil can be burned out of the charge by using a strongly oxidizing flame at the beginning of the heat until the black smoke has cleared away. The flame should then be adjusted to a normal, slightly oxidizing condition. In crucible furnaces this is somewhat more difficult to accomplish but it can be done. In any case there is a tendency for the turnings to become covered with a film of oxide, which makes them difficult to melt and, of course, the metal loss is increased.

In the low-frequency induction furnace, oil is an unmitigated nuisance, while in the indirect-arc furnace its presence is fatal. Instead of burning, the oil breaks down to a soot, which floats on the surface of the metal and, under the intense heat of the arc, reacts with sand or siliceous material in the lining to release metallic silicon. Red brass or bronze melted under these conditions is absolutely unfit for casting. As little as one-hundredth of 1 per cent silicon is sufficient to affect the quality of the metal. Alloys containing 20 per cent or more of zinc are less susceptible to this trouble.

In any furnace the likelihood of gas porosity is great if oil or grease is present in the metal charged. It should be removed prior to melting, following the practice described in a previous article (FOUNDRY, Sept. 1955, p. 157).

The greatest single cause of gas porosity in the red copper-base alloys is thought to be hydrogen derived from water vapor. Hydrogen is soluble in molten brass, which may pick it up from combustion gases, from moisture in furnace linings or pouring ladles, or from air humidity when the metal is poured. There is little danger of hydrogen pickup from the substance of crucibles. However, refractory linings in hearth-type furnaces always contain much water when newly installed and, later on, as a result of patching.

Thorough drying of freshly laid refractory is highly important and difficult to attain. New linings or old linings which have been heavily patched should be slowly preheated to a bright-red heat and then allowed to soak up heat for some time. Even then the first melt or two from such linings should be viewed with suspicion and preferably poured into castings in which gas porosity is not a critical factor. If this is not practical, the use of an oxidizing flux, such as copper oxide, will help. The use of fluxes and other means for dealing with gassed metal will be discussed in a later article. For the moment we are concerned with avoiding this condition rather than with curing it.

Melt Rapidly, Pour Promptly—In fuel-fired melting it is important to melt rapidly and to pour the metal as soon as it is ready. The higher the temperature the more susceptible the metal to gas absorption and to contamination by chemical reaction. Superheating the metal to excessive temperatures probably does not of itself injure the metal, but it does promote any contaminating condition which may be present. The longer the metal is exposed to such conditions the more extensive the damage.

With electric furnaces the situation is somewhat different. If free from water vapor, the stag-

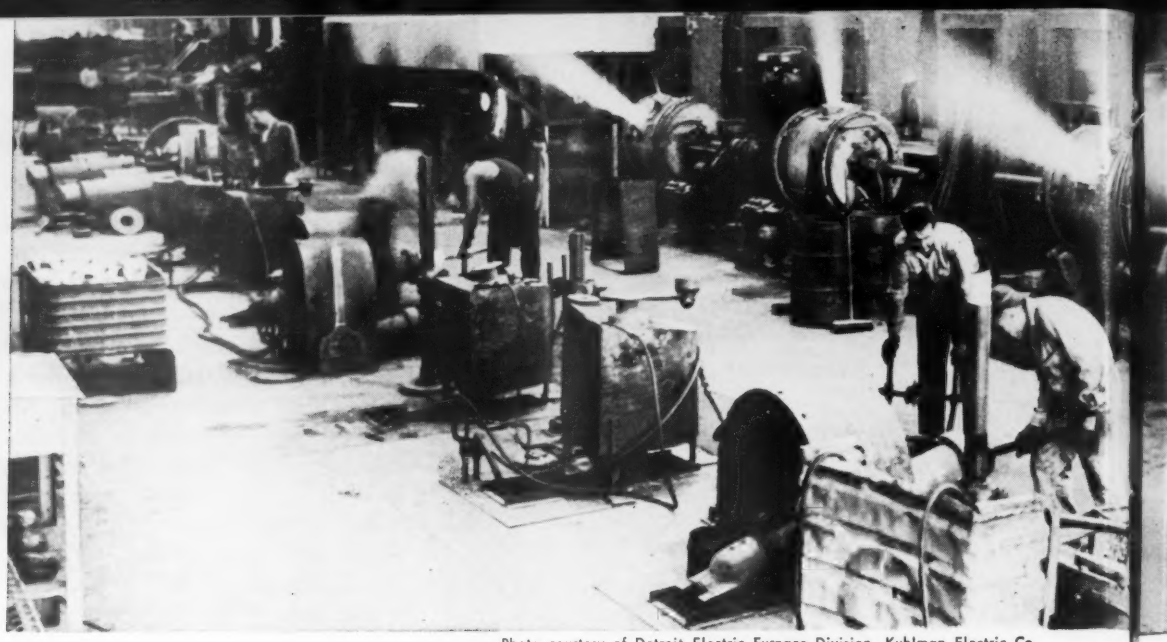


Photo courtesy of Detroit Electric Furnace Division, Kuhlman Electric Co.

nant atmosphere is harmless and the metal is not likely to suffer from prolonged heating, even at excessive temperatures. In the low-frequency induction furnace it is common practice to keep the furnace nearly full of metal throughout the day, pouring small quantities at frequent intervals. The same practice has been successfully followed with the indirect-arc furnace.

Knowing when the metal is hot enough to pour is a matter requiring considerable skill. If poured too cold it is useless, if poured too hot there has been a waste of time and fuel, possibly damage to the metal. It is possible but not convenient to measure the temperature of the metal in the furnace; this is sometimes done. As a rule the foundry depends upon the judgment of the melter. It is up to his supervisor to make sure that the melter doesn't play safe by always bringing out the metal much too hot.

The electric melter does have the advantage of knowing from his watt-hour meter how many kilowatt-hours he has used as the heat progresses. From this an alert and intelligent operator learns to gage closely by experience how many kilowatt-hours each heat needs, making due allowance for the weight of the charge, the results of the last previous heat and any delays which may have taken place. It is possible most of the time to bring metal out of the furnace at a temperature not more than 50° or 75° F above that desired for pouring the molds.

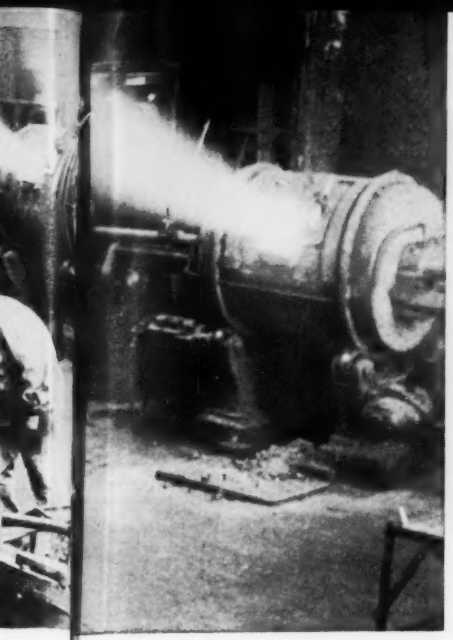
During periods of idleness, nights, Sundays and holidays, the low-frequency induction furnace uses a low power input to keep the metal in the induction channel from freezing. If the standby period is more than 48 hours, it is advisable to run the furnace at full voltage for a few minutes, else a partial freeze may result in a slow start when the furnace is needed. If there is to be a protracted period of idleness, it is customary to drain the furnace completely and allow it to cool. When production requires, a fresh start is made with molten metal. This doesn't always work because cracking of the refractory sometimes results from contraction and expansion of the vitrified lining.

A practice probably more common in English than in American foundries is described in a recent article (Maurice Cook, C. L. M. Cowley and E. R. Broadfield: "The Use of Refractories in Low-frequency Induction Furnaces for Melting Copper Alloys," *Journal,* Institute of Metals, February, 1955. p. 295). When it is desired to shut down a furnace, the molten metal in the channel is allowed to cool very slowly, with intermittent applications of electric current during freezing, until the metal is solid. To put the furnace back into service the metal is heated very slowly by gradually increasing amounts of current until again completely molten. Unless this operation is carried out with extreme care there is not only danger that the refractory may crack but also a likelihood that the metal, as it solidifies in the channel, may separate so that the electric circuit cannot be re-established.

Charging the Furnace—As a rule the proportion of turnings which can be used in a charge is limited to about 20 per cent. This should be charged first, then weighted down by ingot or other heavy pieces of metal. Bulky material, such as gates, sprues and scrap castings, is charged last. In the crucible this has to be done step by step; in hearth-type furnaces there is commonly room to charge the whole amount at one time.

Turnings are sometimes briquetted, in which case there is no limit to the proportion which can be used. In the induction furnace, turnings can hardly be melted at all unless they have been briquetted, since loose turnings will float on top of the bath and melt with difficulty. In such a case more or less continuous poking is required. In the indirect-arc furnace there is no limit to the use of loose turnings; the combination of a tumbling charge and a nonoxidizing atmosphere makes it possible to melt loose material with the same speed and efficiency normally experienced.

Another practice peculiar to the indirect-arc furnace is to charge the first morning heat at the close of work the night before. In this way the metal absorbs much heat during the night from the fur-



In electric furnaces, heat insulation is so important that it often is more profitable to replace old linings impregnated with metal than to try to obtain additional lining life

nace lining and the first heat of the day is less sluggish than it would otherwise be.

Furnace Atmospheres—The use of special atmospheres, such as nitrogen, in nonferrous melting is not new but is not common. Vacuum melting, or the elimination of atmosphere, has also been practiced on a laboratory scale for some time and has recently been suggested for full-scale production. For the light alloys and for some of the difficult metals, such as titanium, the theoretical advantages of vacuum melting are evident. The same may be true of pure copper, and it is asserted that the copper-base alloys benefit in pressure tightness and tensile strength when melted under vacuum.

It is true that the presence of zinc or any other volatile element which would boil out of the alloy at low pressures would seem to be an impediment. It is hard to see how vacuum melting could be applied to direct-flame or indirect-arc furnaces. A completely closed melting chamber is needed such as might be provided in crucible or electric induction furnaces. One concludes that for the most part the industrial advantages and disadvantages of the vacuum technique remain to be explored.

Refractory Maintenance—This is an essential feature of melting practice. For crucible furnaces this is not much of a problem. New crucibles should be brought up to heat slowly when first used, and old crucibles should be scrapped before they fall apart. Large crucibles in tilting furnaces should be replaced when experience shows they have reached nearly the end of their life. Otherwise failure while in service will result in an annoying interruption of production. Crucible tongs for lift-out crucibles need to be carefully fitted to the contour of the crucible or its life may be considerably shortened.

Low-frequency induction furnaces melting high-zinc alloys, for which they are especially suitable, will run for very long periods of time without any attention to the refractory linings. A gradual tendency for the power input to drop due to a building of dross in the induction channel can be controlled by rodding. An occasional dose of phosphor copper during periods of standby operation also helps. When melting red metal, however, the induction channel slowly enlarges and the flow of current gradually increases to a point where the furnace must be taken out of service. Although a reasonably good lining life can be obtained with the red alloys, it is much less than when the high-zinc alloys are being melted.

Cylindrical furnaces, such as the indirect-arc furnace, or furnaces with an arched roof, like the reverberatory furnace, offer a considerable refractory problem. The lining when installed must fit closely, with a minimum of joint thickness. Patches should be hard rammed and, if the patch is deep, it should be applied in thin layers, taking care first to chip away slag so that the patch is in intimate contact with unfused refractory. A skillful repairman can keep a cylindrical lining going almost indefinitely but there comes a time when the lining, consisting almost wholly of patch, is so impregnated with metal that its heat insulating qualities are nearly lost. In electric furnaces heat insulation is so important that it is often more profitable to replace an old metal-impregnated lining than to strive for additional lining life.

Refractories which are to come into contact with hot metal should be selected with care to avoid contamination through chemical action. High-grade fire brick and fire clay or the high-alumina mixtures based on mullite, sillimanite and aluminum oxide are safe materials.

Silicon carbide, one of the most useful refractories, is a special case. When used in a furnace lining it needs to be backed up by exceptionally efficient heat insulation. This is necessary because of silicon carbide's high heat conductivity, a property which, on the other hand, makes it a very useful crucible material where obviously the rapid conduction of heat is an advantage. In this application the silicon carbide is completely covered by glazed vitreous material and thus does not come into direct contact with the melt. In contact with molten brass and bronze, particularly alloys containing substantial percentages of lead, silicon carbide is likely to cause silicon contamination. For this reason it cannot safely be used in the indirect-arc furnace except for that portion of the lining immediately around the door, where contact with metal is only casual. An exception can be made for high-zinc alloys containing less than 5 per cent lead, where silicon contamination need not be feared.

Watch Water Vapor—It may be well to emphasize once more the evil influence of water vapor at every stage of the melting process. It is unavoidably present in combustion gases but its effect there can be controlled by keeping the gases at an oxidizing level. Dry metal charges, dry charcoal—if charcoal is used—and dry furnace linings are of top importance. The effect of moisture in ladles, foundry atmosphere and molding sand will be discussed in the next article, which will deal with pouring practice, pouring temperatures and the preparation of metal for pouring.

MATERIALS HANDLING EQUIPMENT

Types and Amount Used in Foundries

It takes a lot of equipment to handle materials in the foundry industry. How much is indicated by the accompanying study just completed by FOUNDRY'S market research department.

This study is based on returns from a questionnaire mailed to a selected list of 4600 foundries. Replies ranged up to 40 per cent for the group of larger plants—those with more than 250 employees. The data received were projected to give totals representative of the entire foundry industry in the United States and Canada.

EFFICIENT handling of materials is one of the major problems of foundry operations. In the case of the castings themselves it involves 1) unloading and stocking the metallic raw materials, 2) charging these materials into melting furnaces, 3) transporting molten metal to the molds, and 4) processing the castings from shakeout through the cleaning department and to the shipping room. This means handling the equivalent of more than 4 tons of metal for every ton of finished castings.

Add to this the approximately 3,000,000 tons of coke consumed annually, plus fluxes, alloys, etc.; then add the hundreds of millions of tons of sand, binders, patterns, flasks and weights handled.

What It Takes—To do this job the foundry industry has at its disposal more than 900 miles of various types of conveyor lines. It also has more than 12,500 power trucks, 28,000 cranes and 55,000 hoists—to say nothing of some 130,000 wheelbarrows and hand-operated trucks.

These figures are based on information supplied FOUNDRY by a representative group of foundries which participated in a study just completed. A detailed breakdown of the number of units of various types of major equipment for handling materials, together with their distribution among foundries of different size, is on the following pages.

Conveyors—The large amount of bulk material handled by foundries — particularly sand — has prompted the increasing use of conveyors. For instance, the number of foundries using belt conveyors has increased more than 50 per cent since 1947, when a similar study was conducted. Nearly 1 million feet of conveyor belts now are in use.

Overhead monorails, used primarily for moving ladles and castings, likewise have found growing adoption; the number of users is up 70 per cent since 1947. Roller conveyor installations have in-

creased 75 per cent since eight years ago.

Trucks—Because they can be used for a variety of handling operations, power trucks are finding growing acceptance. Indicative of the trend in this respect is the fact that approximately one-half of the fork lift trucks used by foundries were acquired during the last five years. Close to 70 per cent of all front-end loaders in service are less than five years old, a percentage which also applies to the mechanized wheelbarrow.

Cranes—Various types of cranes and hoists are among the oldest means of lifting and transporting employed by foundries. Cranes in use average between four and five per foundry, and the average foundry has nearly ten hoists, three-fourths of which are operated by air or electricity.

Buying Intentions—In this study foundries were asked if they expected to order within the next two years any of the various types of equipment surveyed. The percentage of foundries planning such purchases varies widely with the different items, ranging downward from the more than 80 per cent who expect to buy wheelbarrows by 1957.

Approximately one out of every eight foundries is considering installing roller conveyors. The ratio for belt conveyors is one out of twelve, although some of this likely represents replacement needs. Fork lift trucks of the riding type rank high in buying plans, prospective buyers representing about 12 per cent of all foundries. The same percentage applies to probable buyers of bridge cranes, while hoist purchases are proposed by more than one-fourth of the industry.

Growing use of power-operated trucks in general is reflected in some 1700 mentions of buying intentions for this type of equipment. About 80 per cent of this total is represented by fork lift trucks and front end loaders.

WHAT FOUNDRIES USE TO MOVE MATERIALS

Conveyors

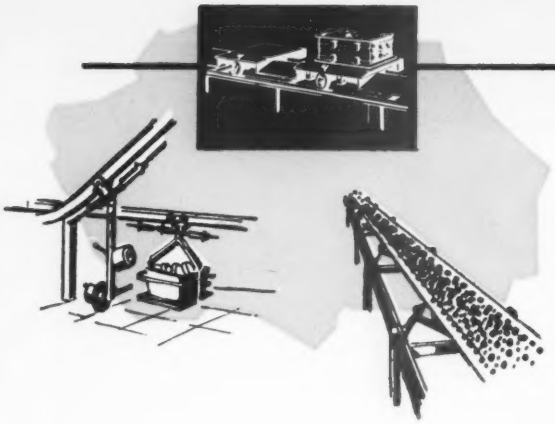
Monorail	2,239,844 ft
Roller	1,046,644 ft
Belt	936,786 ft
Apron	87,084 ft
Car mold	223,661 ft
Vibrating, oscillating	56,198 ft
Bucket elevator	245,412 ft
Pneumatic type	86,842 ft
Portable type	1,868 units

Trucks

Fork lift	6,119 units
Platform type	2,854 units
Front-end loaders	2,045 units
Tow type	989 units
Motorized wheelbarrows	421 units
Other power trucks	261 units
Hand-operated trucks, wheelbarrows	130,702 units

Cranes, Hoists

Bridge cranes	16,662 units
Mobile yard cranes	938 units
Jib cranes	8,782 units
Other cranes	1,928 units
Hand hoists	15,169 units
Power hoists	40,167 units



CONVEYORS

FOUNDRIES in the United States and Canada use about 935 miles of conveyors. Included are all types used for horizontal and vertical movement. Expanding the mileage figure to footage provides a total of 4,922,471 ft for permanent conveyor installations listed in the accompanying table.

Monorail Total Largest—Of the conveyor total, 2,239,844 ft is in overhead monorail and trolley conveyors. Overhead monorails on which hoists, ladles and other equipment are propelled individually by hand or power account for 1,428,952 ft. This averages 497 ft in each foundry using that type of conveyor. Foundries with employment over 50 average 933 ft, and those employing less than 49 average 184 ft. Of the 6208 foundries in the United States and Canada, one in eight says it will buy monorail equipment within the next two years. One in every 4½ foundries employing over 50 will buy, and in shops with fewer than 50 employees one in 12 will buy.

Endless chain or cable trolley conveyors which ride on overhead monorails total 810,892 ft, or 819 ft per foundry using them. For those employing over 50 the average is 1739 ft. Those with less than 50 average 121 ft. Within two years one in about 20 foundries plans installation of overhead trolley conveyor.

Roller Conveyors — Second greatest conveyor footage is in gravity and power rollers. Foundries have 993,056 ft of gravity roller conveyors, an average of 513 ft in plants using the equipment. Plants with over 50 workers average 837 ft; smaller shops average 202 ft. Nearly one in eight foundries expects to buy such equipment in two years.

Power roller conveyors total 53,588 ft. The average for all foundry installations is 227 ft — 283 and 85 ft for the larger and smaller groups, respectively.

Belt Conveyors—Next highest in conveyor footage installed in foundries are belt conveyors with 936,786 ft. For handling materials under 180° F the footage is 748,820. This averages 635 ft for all foundries using such conveyors. Foundries employing over 50 have 874 ft and those under 50 employees averaged 124. Belts for handling hot materials, over 180° F, total 187,966 ft. Installations average 285 ft for all size foundries, 361 ft for the large ones and 117 ft for the smaller shops.

Bucket elevators account for 245,412 ft. Average length is 163 ft. For foundries with 50 or more workers it is 236, and for the smaller ones it is 53 ft. For every 13 foundries, one expects to install a bucket elevator within the next two years.

Mold Conveyors—Total footage of power mold conveyors in foundries is 223,661. Installations average 724 ft for all foundries. Larger shops average 873 ft and smaller ones 64 ft.

Foundries use 87,084 ft of hinged metal apron conveyors. Average footage for all foundries with such equipment is 243. It is 255 ft for those employing 50 or more and 28 ft for the 49 and under employment group. One in every 71½ shops plans to acquire such a conveyor within two years. One in 20 of the larger shops plans to buy, but none in the smaller group.

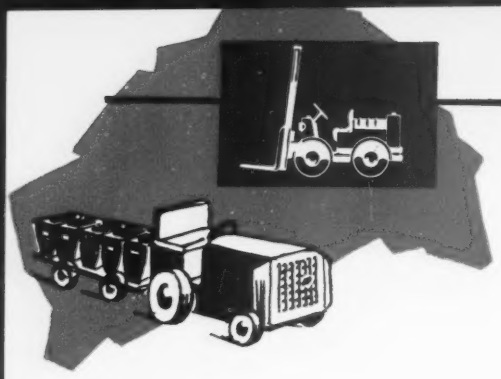
Total footage of pneumatic tube conveyors is 86,842 and practically all is installed in foundries employing 100 or more workers. The average footage is 1113. In this group one in every 14 shops will buy these conveyors during the next two years. Little buying interest was expressed by shops employing 99 or fewer workers.

Vibrating and oscillating conveyors total 56,198 ft, an average of 105 ft per foundry. For those with 50 or more employees it is 130, and for those under 50 it is 36 ft. One foundry in 25 will buy either type within two years. In the larger shops one in eight will buy.

Of the 1868 portable conveyors used in foundries, an average of four units is in each shop of 50 or more employees. Three are in each shop of 49 or under. During the next two years one such conveyor will be bought for every 56 foundries. However, for the 50 or over employment group the ratio is one to 24.

SIZE OF FOUNDRY (Number of Employees)

	Over 1000	500 to 999	250 to 499	100 to 499	50 to 99	20 to 49	Under 20	Total
Overhead Monorail								
Number of Foundries	47	65	202	374	513	724	949	2,874
Footage	211,802	132,396	192,318	236,152	347,967	180,657	127,660	1,428,952
Overhead Trolley								
Number of Foundries	35	48	82	137	125	208	355	990
Footage	397,520	58,231	139,595	119,895	27,284	42,916	25,451	810,892
Power Roller								
Number of Foundries	22	18	42	57	30	27	40	236
Footage	10,121	3,169	16,711	13,584	4,292	3,847	1,864	53,588
Gravity Roller								
Number of Foundries	47	58	202	329	312	494	494	1,936
Footage	142,676	79,229	244,523	202,363	124,303	158,077	41,885	993,056
Belt—Hot Materials								
Number of Foundries	26	46	125	159	100	139	64	659
Footage	47,359	40,035	37,613	21,129	18,299	17,649	5,882	187,966
Belt—Cold Materials								
Number of Foundries	47	69	195	306	189	181	176	1,163
Footage	253,853	112,351	182,406	121,192	34,845	25,610	18,563	748,820
Hinged Metal Apron								
Number of Foundries	39	50	125	119	6	20	...	359
Footage	38,247	17,686	18,006	11,988	588	569	....	87,084
Power Car Mold								
Number of Foundries	33	45	85	72	17	20	37	309
Footage	84,117	40,545	58,650	35,352	1,377	1,400	2,220	223,661
Vibrating & Oscillating								
Number of Foundries	39	44	118	136	54	81	64	536
Footage	14,147	4,493	16,993	13,645	1,634	3,908	1,378	56,198
Bucket Elevator								
Number of Foundries	43	69	204	317	271	333	265	1,502
Footage	52,990	30,503	56,328	53,459	20,509	18,758	12,865	245,412
Pneumatic Tubes								
Number of Foundries	23	16	33	6	..	....	....	78
Footage	43,480	10,109	23,801	9,452	..	...	...	86,842
Portable Conveyors								
Number of Foundries	23	22	79	91	107	81	104	507
Number of Units	116	56	309	437	371	287	292	1,868



TRUCKS

Power and Hand Operated

MANY of the more than 12,500 power trucks in use in foundries have been acquired in recent years. Approximately one-half of the 6100 fork lift trucks have been in service less than five years. An even larger percentage of the 2000 front-end loaders fall in that age bracket.

Platform and tow trucks have seen relatively longer service than the fork type; close to 30 per cent of these type units are more than ten years old.

A number of special attachments are available which add to the versatility of power trucks. These include shovels for fork trucks, forks for front-end loaders, fork rotating devices, clamp and turn devices and such attachments as snow plows. Foundries indicated they are using a total of more than 1000 of these devices.

Hand-operated trucks and wheelbarrows still find widespread use in foundries. Nearly 50,000 wheelbarrows and more than 80,000 of other types are listed in service. The majority of the latter are casting trucks and carts.

SIZE OF FOUNDRY (Number of Employees)

	Over 1000	500 to 999	250 to 499	100 to 499	50 to 99	20 to 49	Under 20	Total
Gas Fork Lift (Riding Type)								
Number of Foundries	40	64	192	369	326	377	347	1,715
Number of Units	563	346	792	997	459	536	461	4,154
% 0-4 Years Old	52.2	45.6	51.0	60.4	61.3	60.8	53.3	55.6%
% 5-9 Years Old	36.2	41.9	42.3	32.1	32.0	32.9	40.0	36.4%
% 10 or More Years	11.6	12.5	6.7	7.5	6.7	6.3	6.7	8.0%
Electric Fork Lift (Riding Type)								
Number of Foundries	23	34	73	103	59	34	....	326
Number of Units	338	140	272	256	118	54	....	1,178
% 0-4 Years Old	53.3	42.3	38.6	55.6	35.7	33.3	....	46.4%
% 5-9 Years Old	31.5	41.5	36.4	42.2	35.7	66.7	....	38.1%
% 10 or More Years	15.2	16.2	25.0	2.2	28.6	....	....	15.5%
Gas Fork Lift (Walkie Type)								
Number of Foundries	....	....	6	23	24	7	8	68
Number of Units	....	....	24	34	77	7	8	150
% 0-4 Years Old	....	....	75.0	50.0	33.3	42.7	....	42.7%
% 5-9 Years Old	....	....	25.0	50.0	66.7	57.3	100.0	57.3%
Electric Fork Lift (Walkie Type)								
Number of Foundries	21	18	76	68	24	21	8	236
Number of Units	213	95	167	90	35	21	16	637
% 0-4 Years Old	59.0	35.9	53.7	40.0	83.3	66.7	....	51.7%
% 5-9 Years Old	39.3	64.1	40.7	53.4	16.7	33.1	100.0	45.5%
% 10 or More Years	1.7	....	5.6	6.6	....	....	....	2.8%
Platform Type (Gas)								
Number of Foundries	21	24	76	103	30	21	....	275
Number of Units	166	75	174	250	30	27	....	722
% 0-4 Years Old	6.5	10.8	31.7	45.5	60.0	50.0	....	30.3%
% 5-9 Years Old	50.0	54.1	46.3	33.3	20.0	25.0	....	41.7%
% 10 or More Years	43.5	35.1	22.0	21.2	20.0	25.0	....	28 0%
Platform Type (Electric)								
Number of Foundries	35	44	136	141	77	79	16	528
Number of Units	380	352	550	487	212	135	16	2,132
% 0-4 Years Old	36.5	22.8	28.1	31.8	28.6	16.7	50.0	29.1%
% 5-9 Years Old	27.0	46.8	34.6	55.3	54.3	50.0	50.0	43 0%
% 10 or More Years	36.5	30.4	37.3	12.9	17.1	33.3	....	27.9%

SIZE OF FOUNDRY (Number of Employees)

	Over 1000	500 to 999	250 to 499	100 to 499	50 to 99	20 to 49	Under 20	Total
Front-end Loaders (Under 1 yd.)								
Number of Foundries	29	38	88	222	176	214	24	791
Number of Units	67	91	199	498	324	308	24	1,511
% 0-4 Years Old	84.4	42.9	48.4	60.3	63.6	73.2	100.0	62.7%
% 5-9 Years Old	9.4	54.8	46.9	33.3	34.1	24.4	....	33.2%
% 10 or More Years	6.2	2.3	4.7	6.4	2.3	2.4	....	4.1%
Front-end Loaders (1 yd. & Over)								
Number of Foundries	18	18	36	52	100	73	16	313
Number of Units	55	32	67	101	177	86	16	534
% 0-4 Years Old	54.8	43.6	72.7	83.3	86.2	72.7	100.0	76.6%
% 5-9 Years Old	45.2	56.4	27.3	16.7	13.8	27.3	....	23.4%
Tow Trucks								
Number of Foundries	35	40	67	98	77	47	72	436
Number of Units	252	146	177	188	100	54	72	989
% 0-4 Years Old	40.3	20.0	27.6	43.8	30.0	60.0	100.0	40.0%
% 5-9 Years Old	24.4	45.0	39.6	46.9	20.0	....	....	30.9%
% 10 or More Years	35.3	35.0	32.8	9.3	50.0	40.0	....	29.1%
Motorized Wheelbarrows								
Number of Foundries	3	4	21	63	112	47	24	274
Number of Units	15	6	55	96	171	54	24	421
% 0-4 Years Old	71.4	....	58.8	75.0	74.1	75.0	100.0	72.7%
% 4-5 Years Old	28.6	100.0	41.2	25.0	25.9	25.0	....	27.3%
Other Power Trucks								
Number of Foundries	11	16	18	23	24	14	16	122
Number of Units	47	30	49	68	24	27	16	261
% 0-4 Years Old	79.3	76.9	18.8	71.4	....	100.0	100.0	61.7%
% 5-9 Years Old	6.9	15.4	50.0	28.6	100.0	....	....	28.7%
% 10 or More Years	13.8	7.7	31.2	....	....	....	....	9.6%
Fork Truck Shovels								
Number of Foundries	13	14	33	102	65	67	32	326
Number of Units	29	20	45	141	65	67	32	399
Loader Forks								
Number of Foundries	....	6	15	64	47	54	56	242
Number of Units	....	30	39	140	71	73	72	425
Fork Rotating Devices								
Number of Foundries	15	12	27	23	6	14	....	97
Number of Units	65	24	67	34	6	20	....	216
Clamp, Turn Devices								
Number of Foundries	4	2	6	18	12	....	....	42
Number of Units	7	14	9	18	12	....	....	60
Other Attachments								
Number of Foundries	11	6	15	41	18	20	....	111
Number of Units	53	8	30	69	18	20	....	198
Wheelbarrows								
Number of Foundries	43	65	216	526	671	1,171	2 333	5,025
Number of Units	1,494	1,595	4,354	9,374	12,100	10,738	9,510	49,165
Casting Trucks, Carts								
Number of Foundries	28	44	118	311	354	656	1,005	2,516
Number of Units	2,816	1,502	10,579	10,596	5,633	7,185	9,558	47,869
Core Trucks								
Number of Foundries	34	50	149	414	448	602	624	2 321
Number of Units	2,890	631	1,719	1,817	1,428	1,645	1,418	11,548
Pallet Trucks								
Number of Foundries	16	16	94	143	271	334	339	1,213
Number of Units	720	85	409	1,540	1,159	1,150	706	5,769
Other Hand Trucks								
Number of Foundries	41	46	146	283	407	649	1,392	2,964
Number of Units	1,929	739	1,315	2,338	1,859	2,904	4,047	15,131

CRANES, HOISTS

and Auxiliary Equipment

CRANES have to move a lot of material in foundries. That is why there are so many of them—28,310 of all types. Of the total, 16,662 are bridge cranes—10,397 of under 5-ton capacity, 4979 of 5 to 15-ton capacity and 1286 of 20-ton capacity or more. Both large and small foundries use bridge cranes although the heavier capacity units naturally are found mostly at the larger plants.

A total of 938 mobile yard cranes are in use, with foundries having over 1000 employees averaging more than two per plant. However these units also are found among the smaller foundries. Jib cranes in use total 8782, and there are 1928 other type units in addition to the three types specified.

Hoists represent an even larger number of units. Foundries of all sizes use a total of 55,336 electric, air and hand hoists, and plants in every size category are using each type. A breakdown by types reveals that 21,037 of the hoists are electric, 19,130 are air and 15,169 are hand types. The industry-wide trend to mechanization is underlined by the fact that more than 70 per cent of the hoists in use are power units. Even more significantly, foundries planning to buy this type of equipment are leaning to power hoists by a ratio of more than 4 to 1.

Under the heading of auxiliary equipment, the survey covers five types of handling equipment—lifting magnets; buckets, such as clamshell and dragline; chain and wire slings; metal, wire and wooden skid boxes; and self-dumping hoppers.

Use of lifting magnets is confined, of course, to foundries casting ferrous metals, and they are employing 1844 such units. Of the various types of buckets, 1796 are doing foundry jobs. Chain slings outnumber wire slings by nearly 4 to 1: specifically, 26,128 to 7121.

Skid boxes really abound in foundries. The total figure for such equipment hits an impressive 215,645. Metal boxes comprise the majority, with 140,298 in use. Wooden boxes are the runner-up, totaling 67,497, and there are 7850 wire skid boxes.

Self-dumping hoppers in foundries number 14,118, nearly half of which are in foundries with more than 500 employees.

SIZE OF FOUNDRY (Number of Employees)

	Over 1000	500 to 999	250 to 499	100 to 499	50 to 99	20 to 49	Under 20	Total
Bridge Cranes (Under 5 tons Cap.)								
Number of Foundries	41	54	175	306	435	623	899	2,533
Number of Units	1,184	534	2,111	1,850	1,671	1,572	1,475	10,397
Cab Controlled	162	101	209	278	114	68	35	967
Floor Controlled	1,022	433	1,902	1,572	1,557	1,504	1,440	9,430
Bridge Cranes (5-15 tons Cap.)								
Number of Foundries	42	71	189	334	260	347	209	1,452
Number of Units	494	686	1,119	1,404	523	494	259	4,979
Cab Controlled	410	646	938	1,198	331	211	111	3,845
Floor Controlled	84	40	181	206	192	283	148	1,134
Bridge Cranes (20 tons or over)								
Number of Foundries	19	38	61	103	53	34	....	308
Number of Units	287	310	322	262	65	40	....	1,286
Cab Controlled	267	259	322	262	47	33	....	1,190
Floor Controlled	20	51	....	....	18	7	....	96

SIZE OF FOUNDRY (Number of Employees)

	Over 1000	500 to 999	250 to 499	100 to 499	50 to 99	20 to 49	Under 20	Total
Mobile Yard Cranes								
Number of Foundries	35	44	106	182	153	100	96	716
Number of Units	73	71	159	226	183	113	113	938
Jib Cranes								
Number of Foundries	44	61	159	299	218	362	347	1,490
Number of Units	2,103	1,184	1,526	1,591	1,006	797	575	8,782
Other Cranes								
Number of Foundries	20	32	58	74	53	114	162	513
Number of Units	347	122	315	520	100	208	316	1,928
Electric Hoists								
Number of Foundries	37	75	241	499	594	890	1,435	3,771
Number of Units	4,363	1,797	2,963	3,521	2,852	3,044	2,497	21,037
Air Hoists								
Number of Foundries	44	65	183	312	352	415	373	1,744
Number of Units	6,180	3,476	3,402	2,061	1,957	1,244	810	19,130
Hand Hoists								
Number of Foundries	45	60	186	357	477	741	1,522	3,388
Number of Units	2,005	1,040	1,842	1,969	2,352	2,596	3,365	15,169
Lifting Magnets								
Number of Foundries	42	71	184	335	153	114	16	915
Number of Units	282	308	441	499	171	127	16	1,844
Buckets (Clamshell, dragline, etc.)								
Number of Foundries	40	69	156	311	130	74	16	796
Number of Units	229	253	440	600	170	88	16	1,796
Chain Slings								
Number of Foundries	38	50	168	311	277	368	535	1,747
Number of Units	5,448	2,186	6,844	4,630	2,724	2,067	2,229	26,128
Wire Rope Slings								
Number of Foundries	33	42	104	147	176	155	234	891
Number of Units	787	796	1,824	1,290	952	661	811	7,121
Metal Skid Boxes								
Number of Foundries	34	60	171	318	224	227	202	1,236
Number of Units	33,218	15,597	37,558	22,652	7,056	14,123	10,094	140,298
Wire Skid Boxes								
Number of Foundries	12	12	24	29	35	34	56	202
Number of Units	2,654	717	2,314	719	664	555	227	7,850
Wood Skid Boxes								
Number of Foundries	15	34	79	148	159	181	161	777
Number of Units	9,449	2,445	16,653	16,300	12,478	7,788	2,384	67,497
Self Dumping Hoppers								
Number of Foundries	30	46	167	198	206	107	72	826
Number of Units	4,872	2,019	3,480	2,003	771	342	631	14,118

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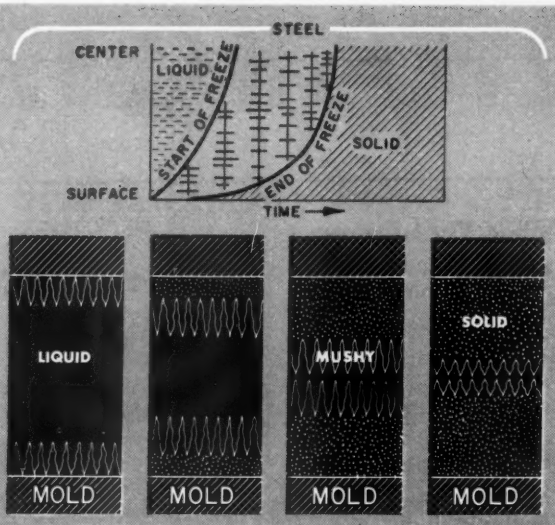


Methods for Improving Soundness of

GUN-METAL BRONZE

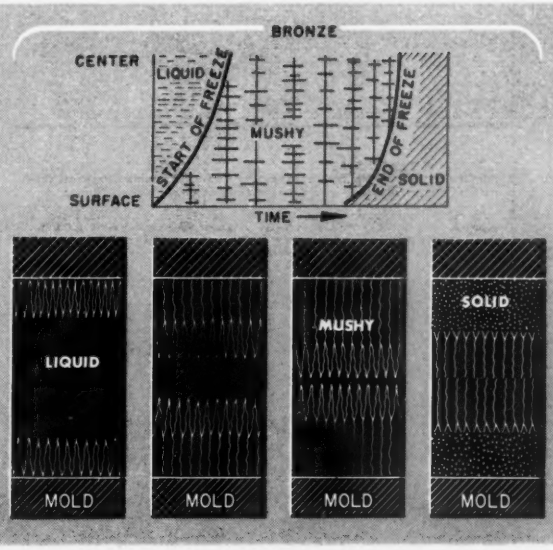
This paper compares vacuum treatment of melts and wedge chilling of castings as methods of improving soundness in gun-metal bronze castings. Experiments show that vacuum treatment reduces gas content of metal so that gas will not be precipitated during solidification. By accentuating directional feeding, wedge chilling permits more nearly complete feeding

MICROPOROSITY in gun-metal bronze may result from shrinkage, gas or both. Microshrinkage occurs very readily because, as thermal studies[1] have shown, bronze solidifies almost uniformly across the entire casting section, resulting in the development of a mixture of liquid and solid metal. Near the end of solidification the relative amount of solid (compared to liquid) may be only a few per cent more near the surface than in the center. The small amount of liquid that remains exists as films and pools between the solid dendrites and if conditions are such that feeding can no longer occur, shrinkage will develop at these regions upon the completion of solidification. This general type of solidification makes feeding difficult since the feed metal must force its way through a tight lattice-work of solid dendrites; hence some degree of microshrinkage occurs in the majority of gun-metal bronze castings.

Steel, on the other hand, solidifies in a more progressive manner—that is, solidification is always in a much more advanced state near the mold-metal interface than at regions near the centerline of the section. Feed metal can more easily flow into the casting because the centerline regions are more open, and when shrinkage occurs within a steel section it will be located near the section centerline rather than be dispersed over the entire section as it is in bronze.

Thermal analysis solidification curves representing the mechanism of freezing of steel and bronze are shown in Fig. 1. The start and end of freeze curves indicate the relative times at which various locations in a section begin to freeze and complete their freezing, respectively. It can be noted that freezing does not start at the center of a steel section until it is completed at the near-surface regions, whereas the entire bronze section is in the intermixed liquid and solid condition during most of the solidification period. Also indicated in Fig. 1 are schematic representations of solidification modes of the two alloys as deduced from the thermal curves. It is apparent that the distributed type of shrinkage characteristic of nonprogressive solidification may easily become interconnected to develop continuous leakage paths through the section.

The nonprogressive solidification mode of bronze indicated by the thermal analyses studies was verified by bleeding a vertically cast slab having dimensions of 4 x 8 x 12 inches at a late stage in its solidification cycle. The slab was fed by means



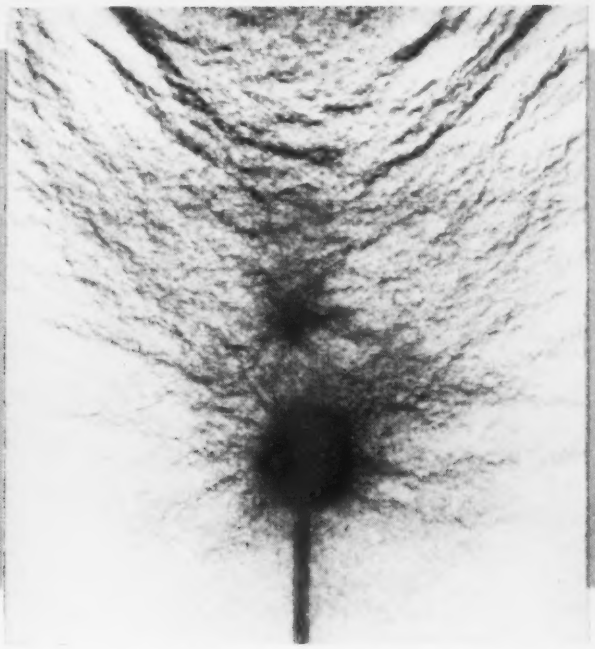


Fig. 1 (left)—Solidification modes of steel and bronze. Fig. 2 (above)—Radiograph shows transverse section from center of 4 x 8 x 12-in. slab, pressure-bled at a late stage of solidification

CASTINGS

Fig. 3—Lowering top of chamber of a vacuum degassing unit. Crucible of metal is on the stand

of a top open riser. Simply inverting the casting at this time would not have accomplished bleeding since the relatively small amount of liquid present would have been retained in the casting by capillarity and surface tension to give the impression that no liquid was present. To remove the liquid is was necessary to blow it out. This was accomplished by incorporating a quartz tube into the mold such that it projected from the outside of the flask to about 3 in. into the mold cavity. A permeable sand core was cemented to the end of the tube within the mold cavity and a tank of nitrogen was attached to the other end.

At the time of bleeding the mold was upended and nitrogen pressure was applied to force the liquid remaining in the slab out through the riser. Fig. 2 shows an x-ray of a portion of a 1-in.-thick longitudinal section removed from the center of the slab. It can be noted that at the time of bleeding, liquid metal (which had occupied the void spaces shown in the radiograph) extended across the entire section. In the lower portion of the radiograph are shown the quartz tube and a portion of the sand core.

Gas Readily Dissolved—Gas porosity occurs in bronze because the melt can readily dissolve large quantities of gas which then must be rejected during solidification. Gas precipitation can intensify the severity of interdendritic type shrinkage or result in gas porosity which, if present in sufficient quantity, may also become interconnected.

Because of the two possibilities for the development of porosity in bronze—lack of feeding and

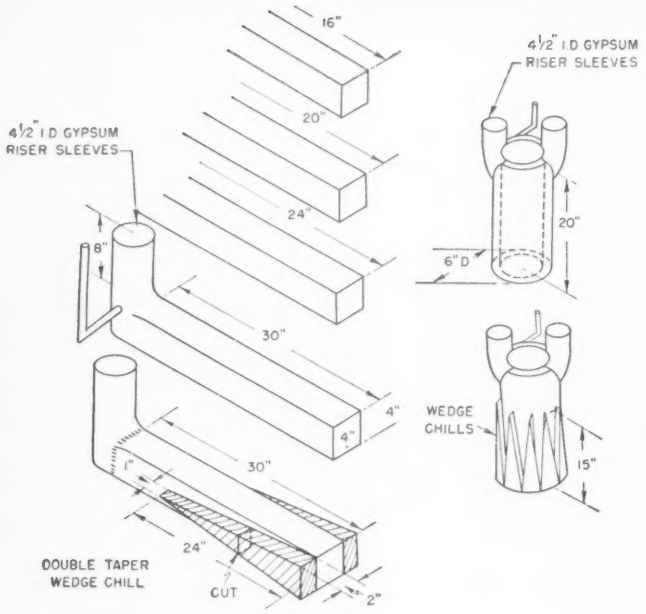


Fig. 4—Tapered chills were used on test castings

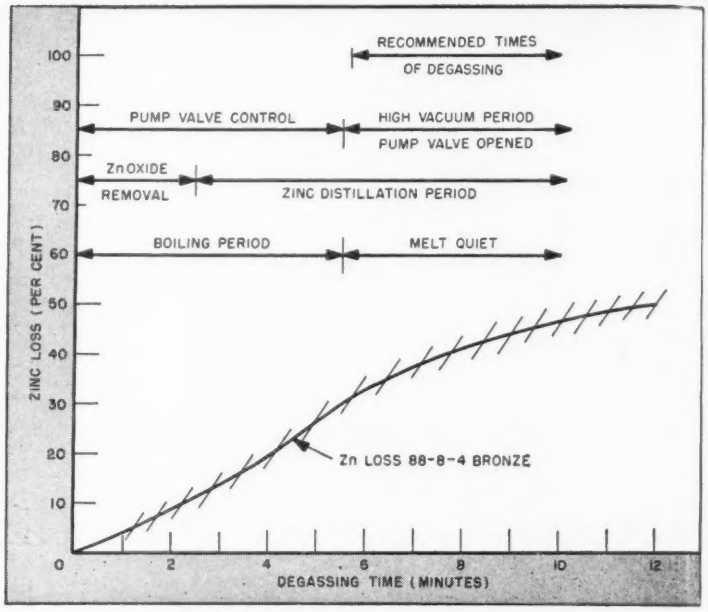


Fig. 5—Effect of vacuum degassing time on Zn loss

presence of gas—the remedy for the defect is not always clearly defined. Obviously, if gas is the cause, measures must be taken to either prevent gas absorption or to remove it prior to pouring. If porosity results from feed metal deficiency, the cure involves either the use of additional risers or increasing the degree of directional solidification. It was determined that alloys which solidify with nonprogressive wall growth require a higher degree of directional solidification than those which solidify in a progressive fashion[2].

Research conducted at the Naval Research Laboratory on the degasification of nonferrous alloys has led to the development of a vacuum degassing technique,[3,4] which has proved to be more effective than methods presently employed to eliminate gas porosity. The practicability and efficiency of vacuum degassing procedures in a production foundry have been demonstrated at the Naval Gun Factory foundry, particularly for aluminum alloys. Fig. 3 shows the Naval Gun Factory unit. The zinc-bearing alloys such as gun-metal bronze are not as easily vacuum treated as are the aluminum alloys and the zinc-free copper base alloys because zinc distillation under vacuum creates certain problems. However, these problems can be minimized, as will be discussed later, to make vacuum degassing a practical tool for improving the quality of gun-metal bronze castings.

Obviously, shrinkage porosity cannot be eliminated by a vacuum degassing treatment. A previous paper[2] shows that the judicious application of external chills is a simple and economical method of eliminating shrinkage porosity. It was found that spot and end chills on gun-metal bronze castings have only a minor effect in promoting directional solidification and soundness, as indicated by hydraulic pressure tests and thermal analyses studies. Such chills have a potent effect on increasing solidification rates and promoting directional solidification for only a short distance from the chill-casting interface. The reason for this is that after a solid skin has developed in the regions next to the chill, the chill effect is one of further cooling the solid surface metal rather than extending solidification farther into the casting.

It was thus concluded that in order to obtain worthwhile improvements in directional solidification the chill design and method of chill application must be such that only short-range effects are required. This led to the use of tapered chills placed on the lateral casting surfaces, Fig. 4. The distance which such chills must act is limited by the thickness of the section upon which they are placed and the chill taper provides a diminishing chill effect upon the casting which promotes directional solidification toward the riser. The present paper summarizes research findings to date which show how the pressure tightness and mechanical properties of gun-metal bronze castings can be improved by vacuum degassing and wedge chilling procedures.

Description of Vacuum Unit—The vacuum degassing unit consists essentially of a chamber which is evacuated by means of a 5-hp mechanical vacuum pump. In operation the upper part of the chamber is lifted from the base by means of a crane, and a crucible of molten metal, melted in a conventional induction, oil, coke or gas furnace, is placed on a refractory stool within the chamber. The top of the chamber when lowered back into position is of sufficient weight to maintain a vacuum-tight seal on the neoprene gasket at the joint, and bolting is not required.

During the vacuum treatment the boiling action within the melt due to gas evolution can be observed through a Pyrex sight glass at the top of the chamber. The chamber is also equipped with

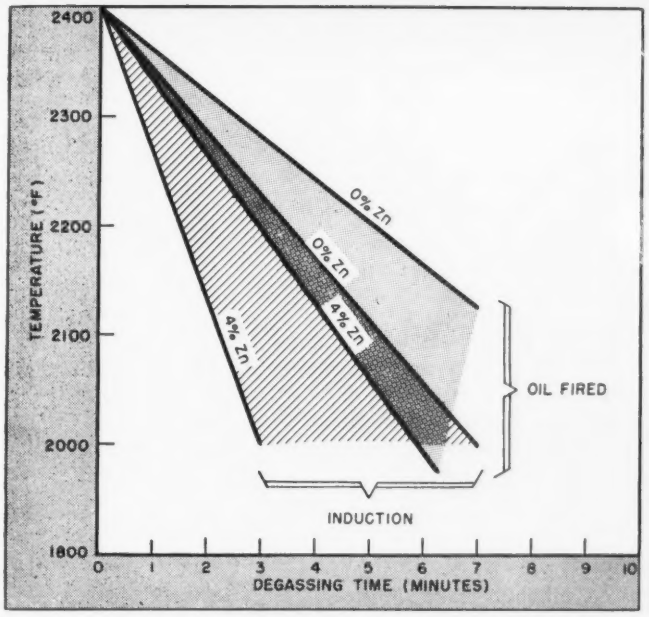


Fig. 6—Effect of degassing on temperature loss, 200-lb bronze melts, 0-4% Zn content. Cooling rates are inversely proportional to Zn content

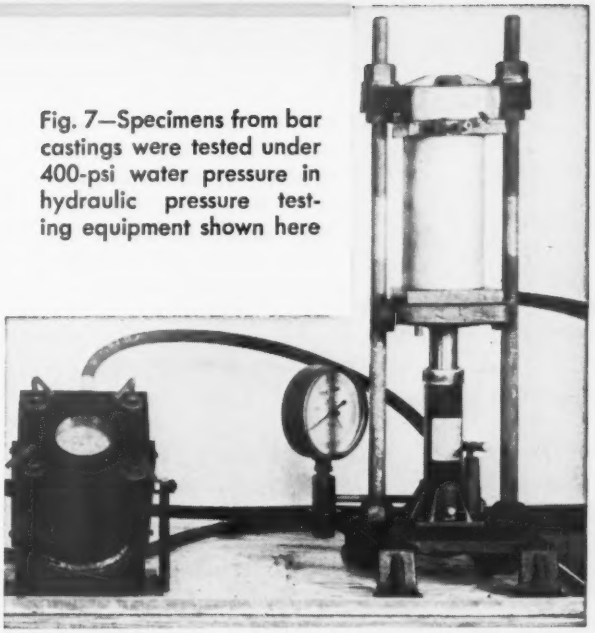


Fig. 7—Specimens from bar castings were tested under 400-psi water pressure in hydraulic pressure testing equipment shown here

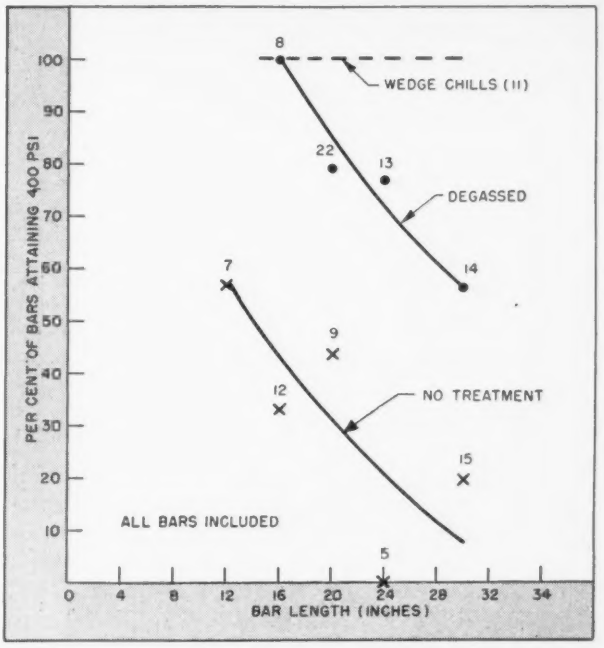


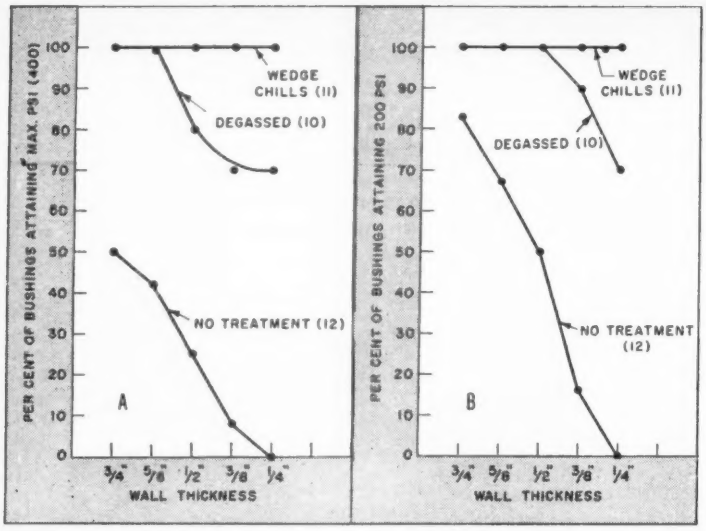
Fig. 8 (lower right)—Effect of chilling and degassing on pressure tightness of "G" bronze bars

a pressure gage and a thermocouple tube which projects into the crucible of molten metal. Pressures below 0.1 mm can be obtained readily with this system. After the degassing treatment, the valve to the pump is closed and air is allowed to enter the chamber through the vacuum release valve so that the top of the chamber can be lifted and the melt removed and poured.

A water-cooled trap is located between the chamber and pump for the purpose of preventing elements such as magnesium and zinc, which partially distill from the melt under vacuum, from entering and damaging the pump. Since the bronze must be superheated to higher than conventional temperatures to insure that it can be removed from the degassing chamber at the desired pouring temperatures, a considerable amount of zinc oxidation occurs within the chamber during the short interval required to exhaust the air from the chamber at the start of the treatment. While the cold trap will collect zinc vapors it will not collect all of the zinc oxide; to avoid contamination of the pump from this source an oxide trap, consisting of a container of steel wool, is present in the line.

The mechanics of operation and the physical reactions occurring within the vacuum degassing chamber containing a heat of G bronze are described in Fig. 5. For the average melt the pressure within the chamber must be controlled manually by means of the valve between the chamber and pump to prevent excessive boiling. After about five minutes the boiling action will have diminished considerably and the valve can be opened completely to permit the maximum capacity of the pump to be utilized. At the beginning of the degassing treatment of zinc-bearing melts, zinc oxide will be liberated until the oxygen within the chamber is exhausted, after which pure zinc will be distilled from the melt at rates indicated in Fig. 5; thus for a degassing period of six minutes, approximately a third of the original zinc content will have been removed from the melt and a corresponding zinc adjustment is necessary prior to pouring.

Experimental Procedures—Two hundred pound heats of Navy gun metal having nominal analyses of 88 per cent copper, 8 per cent tin and 4 per cent zinc were melted in either an induction furnace or an oil-fired furnace. For all heats the residual elements Pb, Ni, Fe, Al and Mn were less than 0.01 per cent. Except where otherwise noted, 2 oz of phosphor copper were added to each 100 pounds of melt prior to pouring. The bar and bushing test castings used in this study and the method of gating



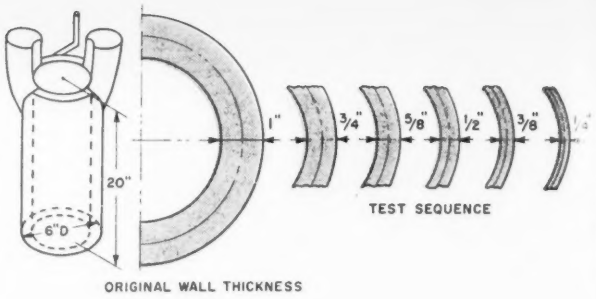
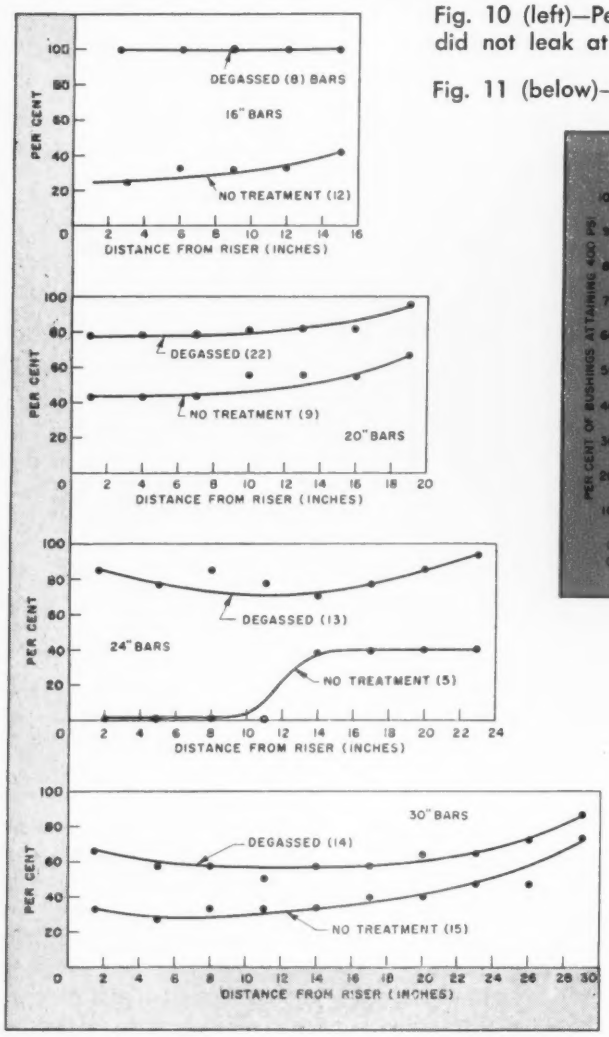
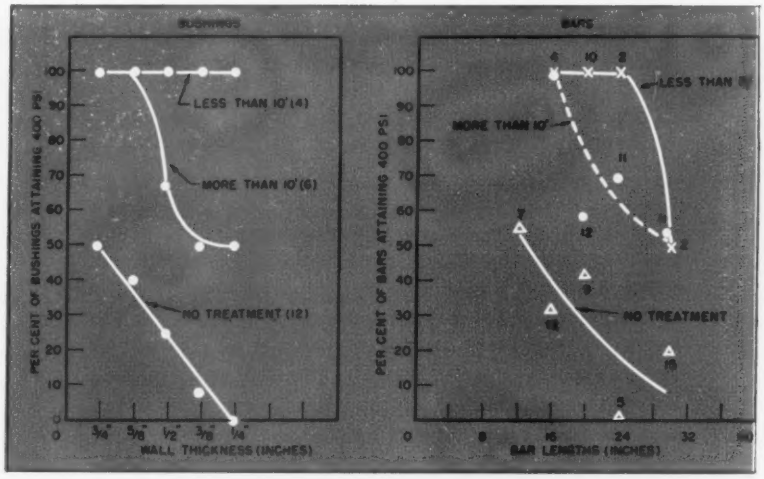


Fig. 9—Diagrams show effect of wedge chilling and vacuum degassing on pressure tightness of "G" bronze bushings. Number of bushings is indicated at each averaged point, as bars were in Fig. 8

Fig. 10 (left)—Per cent of ¼ x 4 x 4-in. specimens from all bars which did not leak at 400 psi. Number of castings is indicated in brackets

Fig. 11 (below)—Showing effect of degassing time on pressure tightness





and risering them are illustrated in Fig. 4. The molds for the castings were made of an AFS No. 80 synthetic sand bonded with 1.5 per cent dextrine, 0.5 per cent cereal, 3.5 per cent bentonite and 3.5 per cent water and were air dried for 24 hours prior to casting.

The vacuum-treated heats for the bar and bushing test castings were made by three procedures. One was to melt virgin copper and tin and add the zinc after the vacuum treatment; another was to melt foundry returns and add sufficient zinc to replace that lost by oxidation and distillation; and a third procedure was to melt and degas a heat of copper, after which both tin and zinc additions were made. In all of the virgin metal heats the zinc was added after degassing. The zinc-free melts, however, are more easily handled in the degassing unit since with zinc-bearing melts the evolution to zinc oxide and zinc vapors within the chamber tends to make it difficult to observe the motion of the melt through the sight glass.

It is necessary that the operator be able to see the melt, particularly when it is highly gassed, since he must control the boiling action resulting from gas evolution by manual operation of the valve to the pump. A too rapid reduction in the pressure may cause the molten metal to boil over the top of the crucible. Pouring temperatures for all test castings were standardized at 2000°F. The nonevacuated heats were superheated to 2050° F; the melts subjected to the vacuum degassing treatment were superheated to between 2200 and 2600° F, depending upon the furnace used, the degassing

Fig. 12—Microporosity in bronze, shown at X40

time to be employed and other test variables described later, so that the melt would not cool below 2000° F during the treatment.

An indication of the temperature losses which occur during the vacuum treatment of 200-pound bronze melts at an initial temperature of 2600° F are shown in Fig. 6. Induction furnace melts cool more rapidly than the oil furnace melts since the crucible in an induction furnace remains comparatively cold during melting whereas the crucible in an oil furnace becomes very hot. With melts larger than 200 pounds the rate of temperature drop would be much less than indicated in Fig. 6. The width of the bands in Fig. 6 are related to the intial zinc content of the melt. The highest cooling rate in each case occurs with 4 per cent zinc present in the melt; the slowest cooling rate occurs when no zinc is present. Intermediate cooling rates occur when the melt contains intermediate zinc contents.

Zinc accelerates cooling of the melt under vacuum by absorbing its heat of vaporization from the melt. Thus, to conserve heat during the vacuum treatment of small melts it is advantageous to prepare the melt with a minimum amount of zinc and then to make the necessary additions after treatment.

The condition of soundness of the castings was evaluated by means of hydraulic pressure tests. In the case of the bar castings, ¼-in.-thick transverse slices were removed from the bar at 3-in. intervals along its length and each ¼ x 4 x 4-in. specimen thus obtained was tested under 400 psi water pressure as shown at the left of Fig. 7. If all such specimens removed from a given bar did not leak, the bar was considered sound. In the case of the 1-in.-thick bushings, ⅛-in. of metal was removed from the inner and outer surfaces, after which the castings were subjected to the pressure test as shown at the right of Fig. 7. After testing, an additional 1/16-in. of metal was removed from each surface (reducing wall thickness by ⅛-in.) and the bushing was again tested. This procedure of reducing wall thickness in ⅛-in. steps and hydraulically testing was continued until the wall thickness was reduced to ¼-in.

Microporosity May Remain — These pressure tests are extremely severe since they require testing through the inferior centerline portions of the castings, yet the fact that a casting is sound by the pressure test criteria does not indicate a complete absence of microporosity. Leakage occurs only when the porosity voids form a continuous channel through the test specimens. A long stringer type of void or several interconnected globular type voids will form such continuous channels. Thus, both distribution and shape of voids are factors which determine hydrostatic soundness.

Good degassing and chilling practices reduce the number and size of the porosity voids and thereby reduce the probability for them to become interconnected. However, single or even duplicate tests are unreliable because the probability of leakage in a given sample depends upon the distribution of the voids. The nature of the problem is such that statistical evidence is needed, and for this reason several castings of each type were made for test purposes.

Tensile properties were determined from 0.37-in.-diam specimens removed from the bar castings. Thus, the effect of vacuum degassing and chilling practices were evaluated in terms of both pressure tests and mechanical properties.

Pressure Test Results—The percentage of bar castings of various lengths and bushing castings machined to different wall thicknesses which were sound according to the hydraulic pressure test criteria are shown in Figs. 8 and 9 for the cases of wedge chilling, vacuum-treated melts and standard foundry practice. In no case did a casting made with the wedge chills develop leakage. While some of the castings poured with vacuum treated melts were not pressure tight, the percentage of sound castings of each type was markedly higher than when poured with untreated metal. Only 57 per cent of the seven 12-in.-long bars cast from untreated melts were completely pressure tight, while all of the 16-in.-long bars poured with vacuum treated melts were pressure tight. For the 30-in.-long bars it may be noted that vacuum treatment of the melt increases the probability of obtaining casting soundness, as indicated by the pressure tests, from 20 to almost 60 per cent.

All of the bushings poured with degassed metal could withstand hydraulic pressures of 400 psi after the first two machining operations which reduced the wall thickness from 1 in. to ⅝-in., while at least half of the untreated bushings leaked in this condition. At a wall thickness of ¼-in., 70 per cent of the bushings poured with degassed metal withstood 400 psi pressures whereas under the same test conditions all bushings poured with untreated metal failed.

A further statistical compilation of the data obtained for untreated and vacuum-treated bar castings is shown in Fig. 10. This figure shows the relative degree of soundness at various locations along each length of bar as indicated by the per-

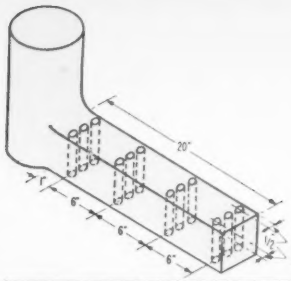
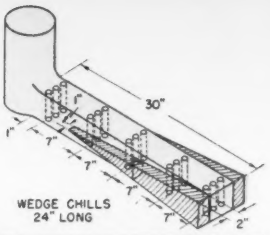
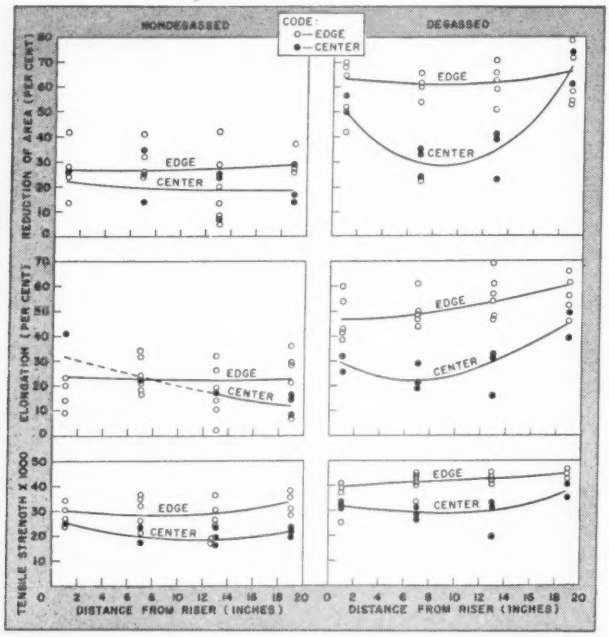
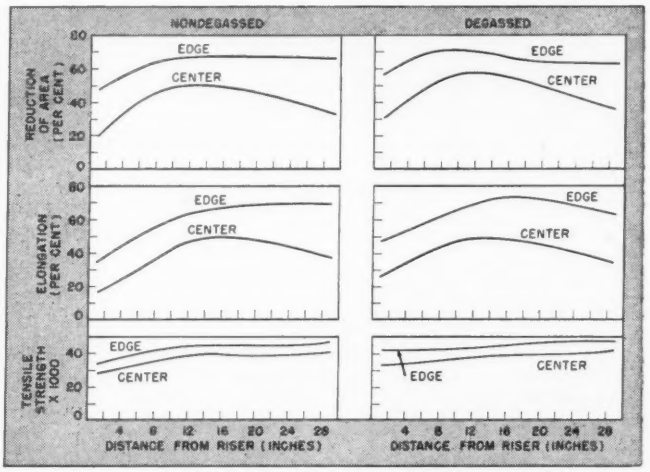


Fig. 13 (left below)—Effect of degassing on tensile properties at various locations in sand-cast 4 x 4 x 20-in. bars

Fig. 14 (right below)—Effect of degassing on tensile properties, various locations in wedge-chilled 4 x 4 x 30-in. bars







centage of individual test specimens removed from these locations which could withstand the 400 psi hydraulic pressure test. Degassing the alloy results in a greater differential between treated and untreated bars in the shorter lengths than in the longer length bars; however, a general decrease in the overall soundness occurs in the degassed bars as the bar length increases.

It may be noted also that there is a tendency for a higher degree of soundness to be obtained at the casting edge. This pattern is to be expected from thermal analyses studies presented earlier[2] which show a higher degree of directional solidification at this location. A similar but less pronounced effect is noticed for near riser positions.

Effect of Vacuum Degassing Time—The vacuum-treated castings, from which the data of Figs. 8 and 9 were obtained, were poured from melts treated under minimum pressures of 200 to 1000 microns and for periods of 6 to 20 minutes. Pressure variations within these limits had no influence upon the integrity of the castings. Variations in degassing time, however, did have an effect and, fortunately, the shorter treatments produced the highest degree of pressure tightness. Thus, since Figs. 8 and 9 include data from all castings irrespective of degassing time, they do not indicate the maximum possible improvement which can result from vacuum degassing. When the castings degassed for 6 to 10 minutes are separated from those degassed for times of over 10 minutes, Fig. 11, it will be noted that most of the castings which developed leakage had been vacuum degassed for periods in excess of 10 minutes. Only one of the 18 bar castings degassed for the shorter periods failed to pass the pressure test, while all of the four bushings poured with melts degassed for periods of 6 to 10 minutes could withstand 400 psi hydraulic pressures even after being machined to wall thicknesses of ¼-in.

The superior results obtained with the shorter degassing time supports a common foundry belief that a little gas in the metal is desirable for pressure tightness. Under conditions where feeding to complete soundness is not possible due to an inadequate gradient condition, as is the case for the relatively long bar and bushing castings, a small quantity of gas will tend to globularize, into isolated regions, the normally long stringer voids resulting from a feed metal deficiency.

This is illustrated in Fig. 12, which presents micrographs obtained from the geometric center, normally the least sound area, of 4 x 4 x 30-in. bars poured with a highly gassed bronze and with bronze which had been vacuum treated for periods of 6 and 20 minutes. The voids in the untreated metal are so numerous that the formation of continuous channels through the casting cross section is highly probable. With optimum degassing, the severity of the porosity condition is greatly reduced and the probability of continuous void alignments is also markedly reduced. The distinct shrinkage type of porosity resulting from the more complete exhaustion of gas from the melt, Fig. 12 right, obviously would result in a tendency for the casting to lose its pressure tightness characteristics. This difficulty is the direct result of the basic inability of the metal to feed to completion because of its mechanism of solidification.

Tensile Properties—Tensile properties at various locations in a casting provide another indication of the relative degree of soundness at these points. Accordingly, tensile specimen blanks were removed from various center and edge locations in the bars (bar lengths were 20 in. and 30 in. for the unchilled and chilled cases, respectively) and the properties obtained are shown in Figs. 13 and 14.

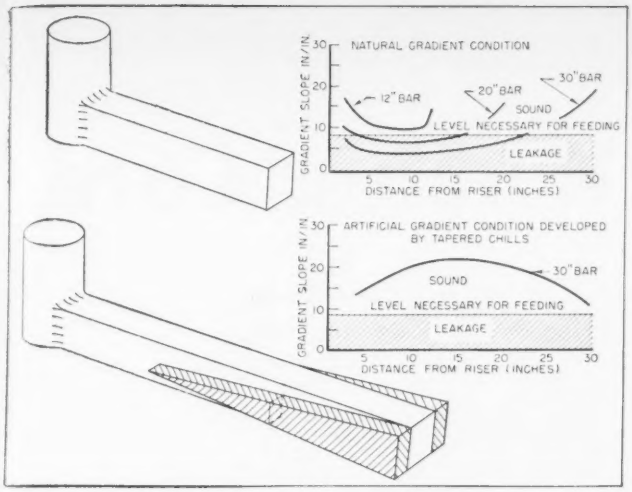


Fig. 15—Gradient conditions at various locations in bronze bars at solidus temperatures

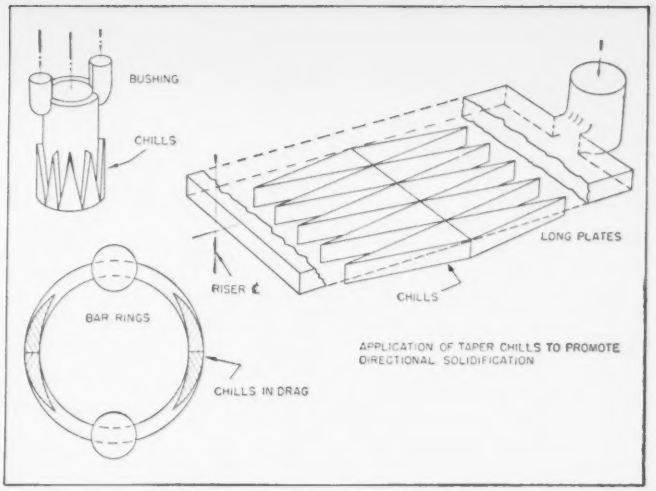


Fig. 16—Application of taper chills on simple shapes to promote directional solidification

In the absence of chills, Fig. 13, the properties at the centers of the castings are inferior to those near the casting edges, regardless of whether or not the melt was vacuum degassed, due to the higher degree of soundness inherent to casting surface locations. However, the properties of the vacuum-treated bars are superior to those at comparable locations in the untreated bars; the tensile strengths average 10,000 psi higher and the ductility values are as much as 100 per cent higher in the castings poured with vacuum-treated melts. Significant superiority in elongation and reduction of area values at the centerline locations in bars poured with vacuum degassed melts is evident only at the casting extremities where favorable feeding conditions exist. The low ductility values at intermediate locations along the centerline of the vacuum degassed bars are the result of shrinkage and are beyond improvement by vacuum degassing treatment. The wedge chills alone, Fig 14, cause excellent mechanical properties to be developed within the casting, and no additional improvement results from the use of vacuum degassed metal along with the chills.

Vacuum Treatment vs Chill Practice—While the use of vacuum-treated melts will cause marked improvement in pressure tightness and mechanical properties of castings, the most positive results may be obtained with lateral chills of the type described. The reason for this is apparent from the gradient conditions present in these castings, as shown in Fig. 15 for the case of bar castings. It has been shown that satisfactory feeding of bars will occur if directional solidification is such that gradients of at least 8°F/inch are established along the casting centerline at the time when each centerline location has cooled to the solidus temperature. Gradients in excess of this minimum are naturally present in 12-in.-long bars, Fig. 15, because of the proximity of the cold casting extremity and hot riser; however, as the separation of these two gradient sources becomes greater by increasing the length of the casting to 20 in. the gradient slopes near the center of the bar fall below 8° F and shrinkage occurs.

In a 30-in.-long casting the gradient slopes become still less and shrinkage becomes more extensive and severe. The application of tapered chills, as shown at the bottom of Fig. 15, increases directional solidification to such an extent that gradient slopes even in 30-in.-long bars exceed the minimum necessary to permit complete feeding. Vacuum degassing of the melt, of course, will not affect the thermal conditions within the casting, and the 20 and 30 in. bars poured with vacuum treated metal will still be incompletely fed; the beneficial effect of degassing results when the porosity is limited only to that resulting from feed metal deficiency. As a result of the higher degree of directional solidification created by wedge chills, the mechanical properties at the center locations of chilled bars are superior to those obtained at center locations of unchilled bars poured with vacuum-treated metal. However, at edge locations where complete feeding occurs naturally the properties are essentially the same for each case.

The use of bars in these studies represents a method of developing basic information. Actually the implications are that casting positions removed from risers and casting edges where solidification is not sufficiently directional will not be fed adequately. The same observations have been made for the case of plate sections and since all castings are essentially combinations of plate and bar sections these data may be applied to any casting design.

It is concluded from these studies that the use of wedge chills is ideally suited for heavy sections, particularly simple shapes as shown in Fig. 16; for irregular sections the chills must be cast to fit the contour of the section on which they are to be applied. Such chills on small castings or castings consisting of thin sections may not be feasible because of molding difficulties and the possibility for misruns. For complex castings vacuum degassing presents a practical and positive procedure for improving casting quality.

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What Happens When a Core

Corebaking is a universal foundry operation, but little has been known about the real nature of what happens during the process. The University of Illinois experiments described here answer some common questions

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FOR a number of years many foundrymen have asked whether a dry sand core, made from a mixture of silica sand, core oil and water and baked in a conventional oven, just reaches the temperature of the oven or actually gets hotter.

Foundrymen also have raised the same question about cores made with a phenolic resin binder. In addition, they have asked whether a core made from either one of the foregoing mixtures requires oxygen to harden and strengthen or merely requires heat.

Answering these questions requires a good circulating oven. Since there is a problem of heat exchange, accurate temperature control and accurate temperature recording, the oven must be equipped so that the controls can be manipulated in such a manner that the heat input just equals heat loss due to radiation. This job can be done best by use of various resistances. Moreover, an electronically controlled potentiometer is almost a necessity to insure rapid and accurate temperature measurements.

The instrument employed has 16 different connecting posts so that 15 different temperature recordings can be taken if desired. The sixteenth connection records the room temperature. Since a complete temperature recording cycle requires 4.27 minutes, a temperature is taken and recorded every 0.27 minute. The instrument also balances itself automatically every hour so that current losses in the dry cell batteries are compensated for. In this investigation, the connections were so arranged that temperatures were taken at each station every 0.27 minute.

To determine whether a core needs oxygen in order to harden and to strengthen when heated requires a closed system of some kind. A steel pipe of approximately 4 in. ID and 20 in. long was used in these experiments. Dehydrated nitrogen gas was used as the atmosphere, and an Orsat gas apparatus was used to determine the oxygen content within the steel tube, as shown in Fig. 2.

The next requirement was to have enough mass and binding material to measure temperature increases or decreases. Small cores weighing 100 grams were used first with no success. Size of the cores therefore was increased to 3½ x 3½ x 3½ in. The core weighed 1200 grams when rammed, and the ratio of sand to oil or resin was 50:1 with 2 per cent moisture by weight added.

The core was rammed by hand and a thermocouple placed in the center. The oven was preheated to 500°F and tests performed at or near 450° F. It was found that an approximate drop of 50° F was encountered when the core was placed in the oven. The sketch appearing in Fig. 1 shows how the core looked on the inside of the oven. Two thermocouples were placed in the oven so that one would be along the side but not touching the core. It was in front of the core as one looked into the oven. The second was placed alongside the core, back of it as one looked inside the oven.

As the test data show, both front and rear couples were at 450° F immediately after the oven doors were closed. Temperature of the core at the start was 65° F, and it took 15 minutes for this mass of sand to reach 210° F, shown in Fig. 3. At this temperature the core remained stationary for 8.5 minutes while the moisture was evaporated. While this happened, the thermocouple in the front of the core gradually lost temperature. The thermocouple in the rear was at 460° F and held this temperature.

The loss in temperature of the front thermocouple was traced to the way the heating elements were arranged in the oven. To hold the oven at 460° F required only one set of heating elements, in the back of the oven. As long as no object was present to cause turbulence, both thermocouples recorded the same temperature; but as soon as the core was placed between them, the front thermocouple lost temperature. It was thought that shields would prevent turbulence, so straight flat shields were tried, but with no success.

It was concluded, however, that since the core containing core oil as a binder actually got 12° F hotter than the back thermocouple and 42° F hotter than the front thermocouple, the test was a success. It showed that when cores are made of material that is exothermic in nature, the temperature of this exothermic reaction can be measured. At the end of the run, the core actually became 5° F cooler than the front thermocouple while the thermocouple at the rear was still at

is Baked?

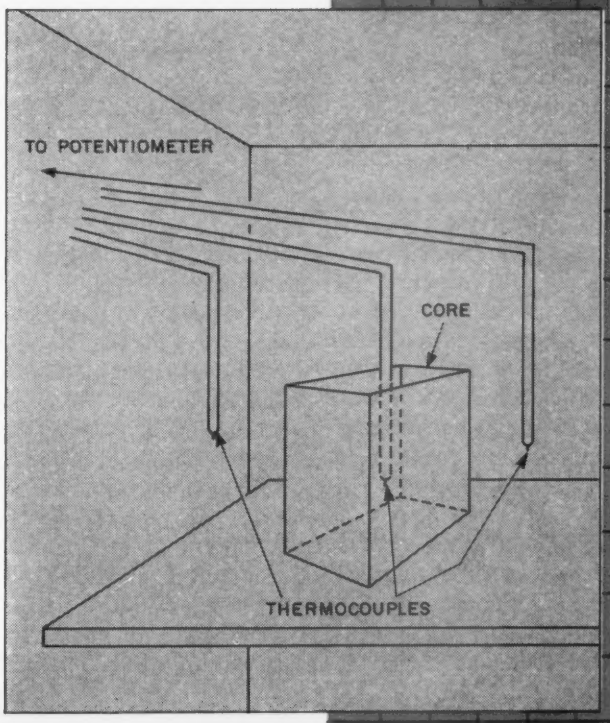

Fig. 1 — Oven section shows the arrangement of the three thermocouples, one in center of core, one in front of it and one behind

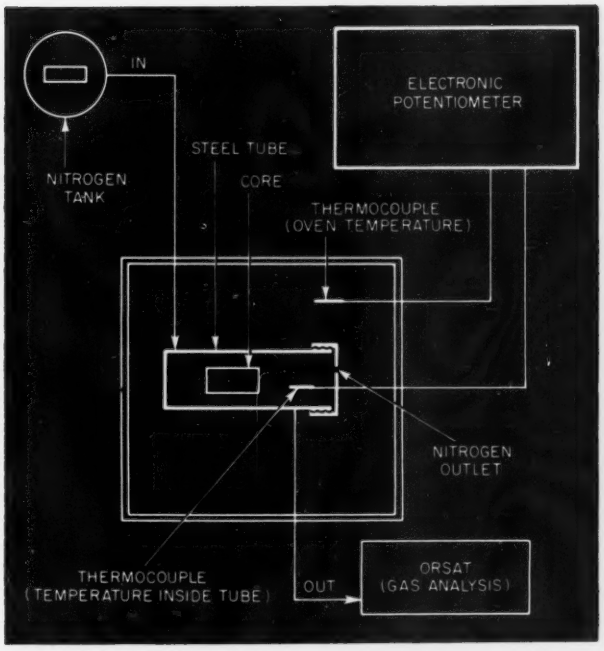

Fig. 2—Diagram shows cross-section of the oven and of the steel tube used in oxygen experiment

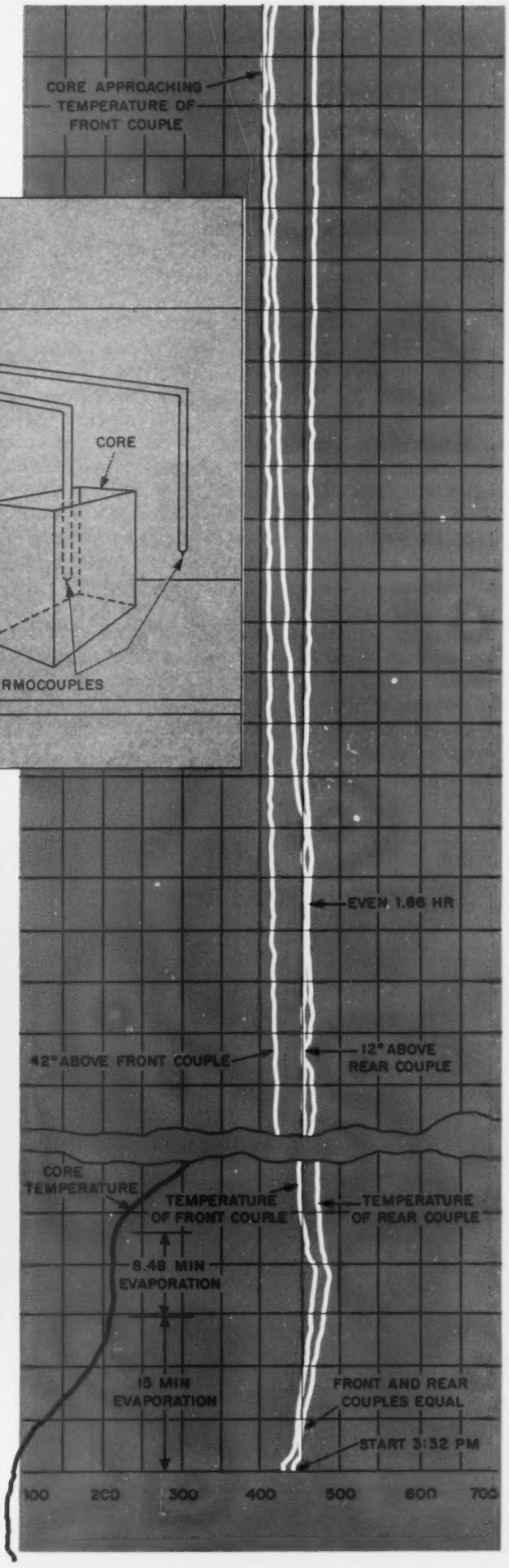

Fig. 3 (right)—Chart based on test data shows temperature changes in core and thermocouples

450° F. The total elapsed time was 7.92 hours.

When the core made from silica sand, phenolic resin and water was tested, test data showed that it took 12½ minutes for the same sized core, with the same ratio of sand to resin as sand to core oil in the first core, plus water, to reach 212° F. Fig. 4 shows the results. A constant temperature, due to water evaporation, was noted for 7 minutes; then the core temperature began to rise. At no time, however, did this core get as hot as the back thermocouple. At its maximum temperature, the core became 10° F hotter than the front thermocouple. This result proved that phenolic resins are not exothermic in reaction. At the end of the test, the back thermocouple was still at 450° F while the core and the front thermocouple were at 400° F. Total elapsed time was 3 hours and 22 minutes.

According to some theories, a core made from silica sand, core oil and water goes through the following cycle when placed in a heated oven. First, evaporation of the water occurs at or near 212° F; second, the core oil, being unsaturated, takes on oxygen; and third, because of heat, a polymerization takes place. If this theory is correct, a core made of the above material, placed in a neutral atmosphere and heated to an elevated temperature should have some strength when removed since it would harden somewhat because of polymerization.

To test this theory, AFS tensile strength test cores were prepared with a ratio of 100 parts of silica sand to 2 parts core oil or phenolic resin plus 1 per cent water by weight.

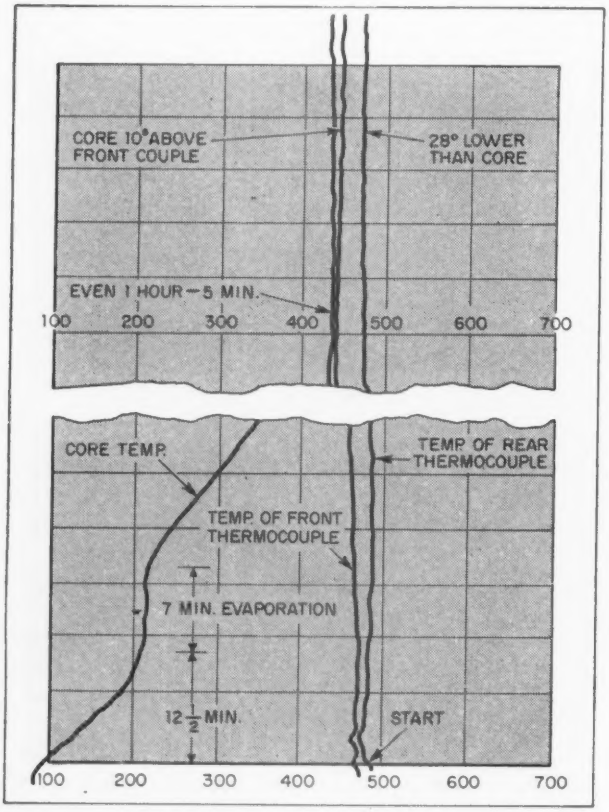

Fig. 4—Chart shows results of test conducted on core made with resin rather than oil binder

These were placed in the tube, and all connections made before the oven heat was turned on. This procedure gave the operator a chance to flush all the oxygen out of the tube, replacing it with a neutral nitrogen atmosphere. Doing so usually took about 10 minutes. As soon as no oxygen was present, as determined by the Orsat apparatus, the oven was turned on. One thermocouple was placed inside the tube and one outside. Temperatures were recorded by electronic potentiometer.

It took approximately 2 hr before the cores reached a temperature of 450° F inside the tube. At the end of this time, both thermocouples were at the same temperature. It was felt that this amount of time was long enough to insure proper oxidation and polymerization. The nitrogen was allowed to pass through the tube while the heat was turned off and the cores cooled to room temperature inside the oven. The cores then were removed from the core plates and tested for tensile strength.

Results of these tests showed that the cores made from silica sand, core oil and water were white upon removal from the steel tube. They were so weak that they could not be removed from the core plates. It was concluded, therefore, that core oils need oxygen to produce cores with tensile strength. It also is an indication or proof that little or no polymerization takes place when a core oil is heated in an oven. The dry strength of the core depends entirely upon the ability of the core oil to oxidize. Of course, this statement holds true only for the above mixture.

It also shows that if the core oil had rosin in it, this treatment did not cause the rosin to precipitate from the solution. Therefore there was no thermosetting reaction. It also shows that the core oil had no polymers in it. It was a light-colored oil. Core oils containing petroleum polymers were not tested.

The next test was performed with a standard AFS tensile specimen made from a mixture of phenolic resin, silica sand and water. The same ratio of sand to resin, and water, were used as that of core oil to sand in the first cores. Since the same times were used as in the first test in a neutral atmosphere of nitrogen, no temperature recordings are shown herein. They were taken, however, and were approximately the same.

When the cores with a phenolic resin binder were removed from the tube, they were brown. They were tested immediately for tensile strength, and the average of five cores was 135 psi. This test shows that cores made with phenolic resin do not need oxygen in order to harden and strengthen. This figure of 135 psi tensile strength checked very favorably with previous values found for this resin in work done and reported in the December, 1954, issue of FOUNDRY in an article entitled "Some Properties of Phenolic Resin Core Binders."

Acknowledgment is made to Mr. Eugene Corbin, senior mechanician in the university's machine tool laboratory, for his help in making apparatus.

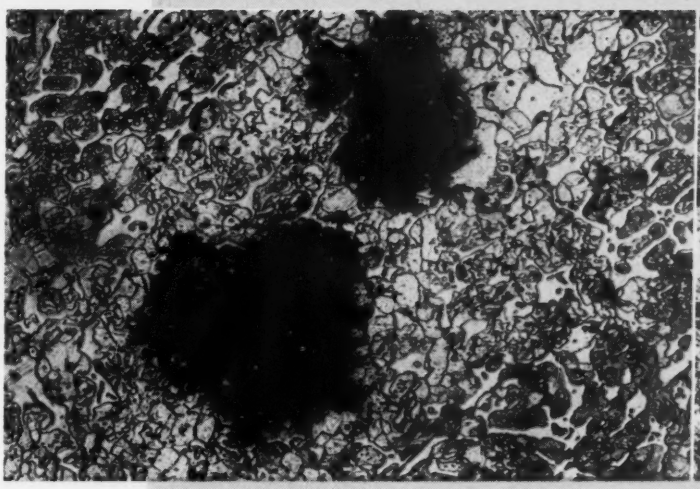

Fig. 1—Nondeoxidized casting after it had been malleablized at 950 and 710°C successively. Not even first-stage graphitization was completed

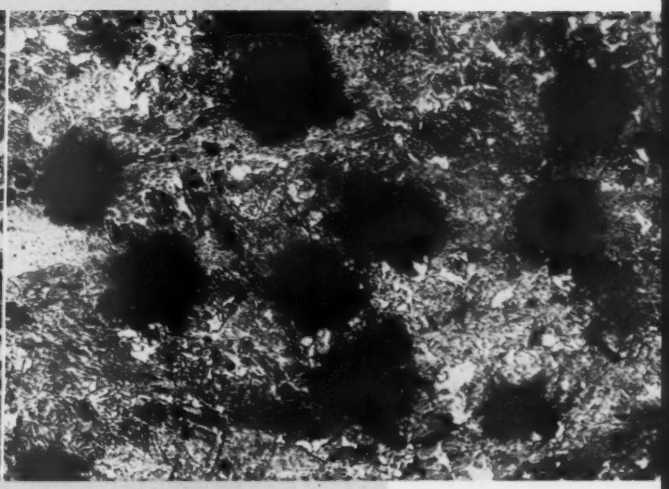

Fig. 2—Casting deoxidized, after same malleablizing treatment, with teapot ladle addition of 0.2% Al. First stage completed, second begun

Deoxidation of Malleable Iron

Small foundries without duplexing facilities must rely on the cupola to obtain chemical homogeneity of the iron. This paper describes the effect on ease of malleabilization of aluminum additions to cupola metal

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IN EXPERIMENTAL work various ways of introducing aluminum into the cupola melt were examined and their effect on ease of malleabilization and final mechanical properties was investigated.

This work was undertaken to aid small foundries, which do not have duplexing facilities and have to rely on the cupola to obtain chemical homogeneity of the iron. It is a very common occurrence at such foundries that after the castings have been subjected to a lengthy malleablizing treatment, a large percentage of the batch has to be discarded, because "it came out as hard as it went into the oven." This, of course, means that the white iron produced is not wholly homogeneous and parts of the heat undergo the graphitizing reaction with extreme difficulty.

The lack of homogeneity results from the fact that all of the alloying elements are added with the charge to the cupola; therefore the final analysis of the iron is hardly—if at all—controllable. Under such conditions thorough deoxidization of the melt is sought in order to dispose of the oxygen in the iron, since oxygen greatly retards graphitization in the malleablizing process.

Of all the usual deoxidizing agents used in iron foundries, only aluminum can be seriously considered. Silicon cannot be used because too high silicon content may produce primary graphite; phosphorus, on the other hand, retards graphitization in the solid state. Other deoxidizing agents are prohibitive because of their high cost.

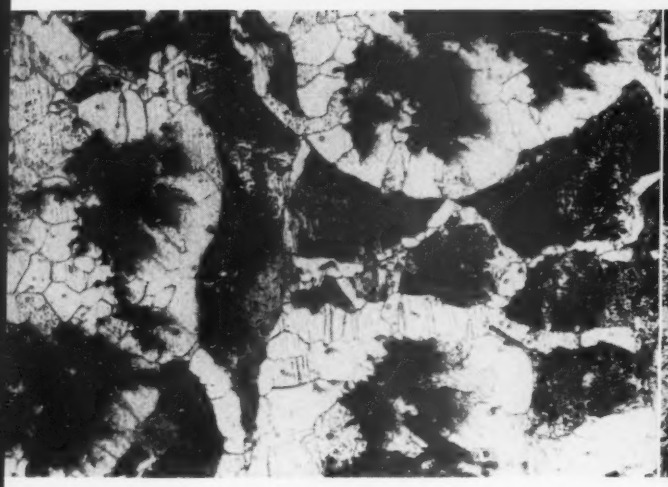


Fig. 3—Casting malleablized as others was deoxidized with spout addition of 0.2% Al. Second stage graphitization is about halfway completed

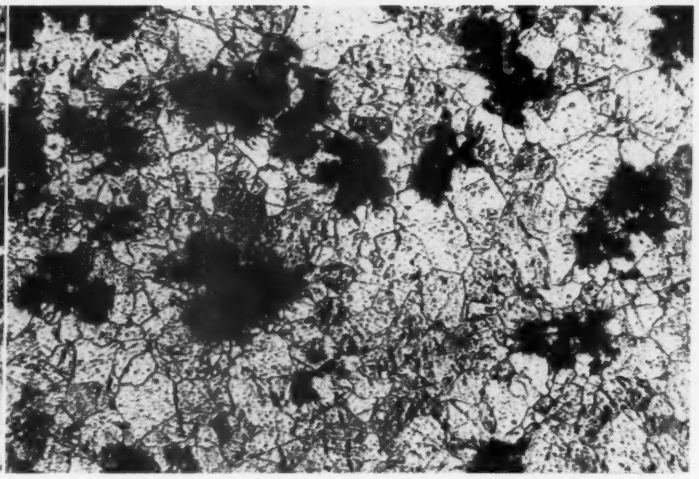


Fig. 4—Casting similarly malleablized was deoxidized with cupola addition of 0.2% Al. In this casting graphitization is nearly completed

To carry out the work and examine the effects of the various forms of aluminum additions on the final properties, fifty heats were examined. With these fifty heats exactly the same raw materials were used and cupola conditions, as well as those of the malleablizing treatment, were kept rigidly constant. The iron used in these experiments had the following chemical analysis: Carbon 2.8-3.2 per cent, phosphorus 0.07 per cent, sulphur 0.20-0.25 per cent, silicon 0.9-1.2 per cent, manganese 0.5-0.6 per cent, remainder-iron.

The silicon content could not be increased—although it aids graphitization—because at a silicon content of 1.4 per cent primary graphite was observed under the microscope on preliminary experiments. This occurred even if extreme chilling was employed. Such an iron without deoxidization has poor fluidity at casting temperature, and intricate castings can hardly be produced without introducing such problems as 1) keeping the teapot ladle volume as low as possible to prevent high temperature drop and 2) pouring intricate shapes only when the iron flows at its hottest. However, keeping the teapot ladle volume as low as possible makes the iron less homogeneous, and malleablizing will be almost impossible. Point No. 2, on the other hand, puts a great strain on the pourers and mold handlers and complicates operating schedules.

Deoxidizing the Iron—Five types of aluminum additions were tried:

1. Additions of solid pieces of aluminum into the teapot ladle.
2. Pouring molten aluminum into the teapot ladle.
3. Adding finely divided aluminum at the spout.
4. Pouring molten aluminum into the spout.
5. Adding aluminum to the cupola with the charge.

Additions of solid pieces of aluminum into the ladle up to 0.2 per cent resulted in no marked temperature rise. Fluidity of the iron was raised about 5 per cent as measured by the AFS spiral fluidity test. (All fluidity tests were made at the same temperature.) It was observed, however, that most of the aluminum, while floating on the molten iron, was oxidized by the atmosphere in the ladle, thereby producing Al_2O_3 slag. This slag gave rise to many difficulties as it accumulated steadily and passed into the pouring ladles. Also, the castings were porous with 1 mm average pore diameter.

The addition of molten aluminum to the teapot ladle raised the average pouring temperature about 10°C, while fluidity was raised only as before—about 5 per cent. Unfortunately, the same slag trouble was encountered as well as porosity in the castings. It is thought that most of the aluminum was oxidized by the air and only a slight amount actually deoxidized the iron. The second difficulty was that no mixing could be attained.

The microstructures of the castings obtained by these two different processes were examined after the malleablizing treatment and were found to be the same. Fig. 2 represents the microstructures obtained by both of these processes.

Comparing this with Fig. 1, which represents a nondeoxidized casting after malleablizing, one can see that because of the slight deoxidation, better graphitization is obtained. While Fig. 1 shows a heavily cementitic structure, Fig. 2 is free from cementite altogether, proving a better degree of Fe_3C decomposition and therefore a markedly better degree of anneal.

Spout addition of aluminum up to 0.2 per cent, whether in the form of chips or in the form of molten droplets, gave the same results. Fluidity was raised 15 per cent and a temperature rise of 30°C average was observed. Unfortunately, the same slag trouble in the teapot ladle and pouring ladles was encountered as in the two previous cases. Porosity decreased considerably, but it was

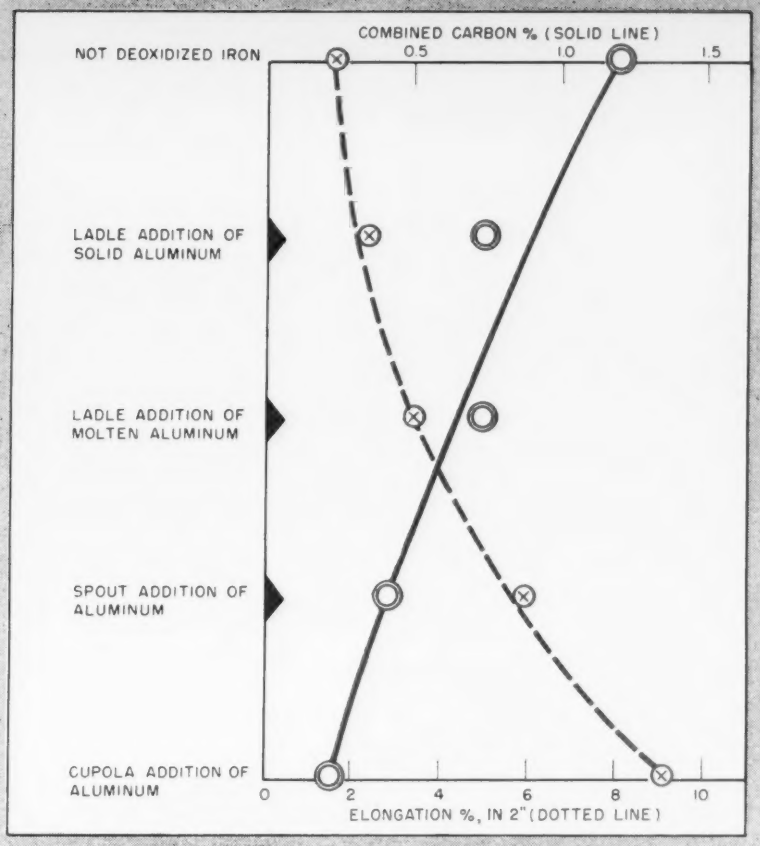


Fig. 5 — Chart illustrates the percentage of combined carbon and percentage of elongation in 2 in. as a function of type of aluminum deoxidation after all castings were malleablized

found occasionally. Fig. 3 represents the microstructure of the castings after malleabilization. Considerable progress can be observed here, as a bull's-eye structure was obtained. Pearlite is not continuous and ferrite is predominant. The progress is attributable to a more thorough mixing of the aluminum with the iron and therefore a better degree of deoxidation.

The charging of 0.2 per cent aluminum into the cupola resulted in a fluidity increase of 30 per cent and a rise in iron temperature of 70°C. Naturally all the Al_2O_3 formed passes off with the slag and the teapot ladle as well as the pouring ladles remained perfectly clean. Porosity disappeared altogether. The large amount of Al_2O_3 in the slag reduced greatly its fluidity and gave rise to slag trouble in the cupola. However, these troubles were overcome by a slight addition of fluorine compounds. Fig. 4 shows the microstructure, after malleabilization of the casting which received a cupola addition of aluminum. This structure consists of graphite and ferrite with traces of pearlite. Pearlite is here in its last stages of decomposition. Mechanical properties of the castings, obtained from the various experiments are summarized in Table 1.

Effect of Aluminum—Malleable cast iron, not especially deoxidized by a proper deoxidizing agent, receives its actual deoxidation by part of its silicon content. Thus, part of the silicon oxidizes to SiO_2 and loses its catalyzing ability to decompose Fe_3C,

Table I—Mechanical Properties of Deoxidized Irons

Types of Al Deoxidation	U.T.S., psi	% Elongation in 2 in.
Teapot ladle addition of solid aluminum	64,100	2.5
Teapot ladle addition of molten aluminum	59,700	3.5
Spout additions	58,000	6.0
Cupola additions	56,500	9.0

because of its insolubility in iron. For all practical purposes and from the point of view of the malleablizing treatment, such an iron may be regarded as having a lower silicon content from that shown by the chemical analysis. The amount of silicon lost can hardly be estimated, as it depends on cupola conditions and other variables which introduce varying quantities of oxygen into the iron. Therefore, the active silicon in the iron will decrease as oxygen content increases.

Introduction of a sufficient amount of aluminum into the iron will reduce the SiO_2, and will render the whole of the silicon content active in the malleabilizing process. On the other hand, aluminum, not being a carbide-forming element, forms solid solution in the iron. Therefore, any excess of aluminum which was not oxidized to Al_2O_3 goes into solution, and, by virtue of its solubility, hastens the decomposition of the Fe_3C.

Unfortunately, the aluminum content cannot be increased without limit, as higher aluminum contents will result in a deterioration of the final mechanical properties of the iron.

Questions and Answers

Some application of seacoal in bronze casting production . . . Must have all information on equipment and costs to determine proper choice of molding method . . . Tendency toward collapse causes trouble with tube . . . Chemical treatment for surface finish . . . Cupola melting . . . Silicate binder

Seacoal for Bronze Castings

QUESTION Is seacoal or pitch ever used as a sand additive in making molds for bronze castings?

ANSWER So far as we know, addition of seacoal or pitch to molding sands in the green state for production of bronze castings is not practiced. However, in the case of dry sand molds for large castings, a small amount of pitch may be added, or the mold may be faced with sand containing about 5 per cent seacoal.

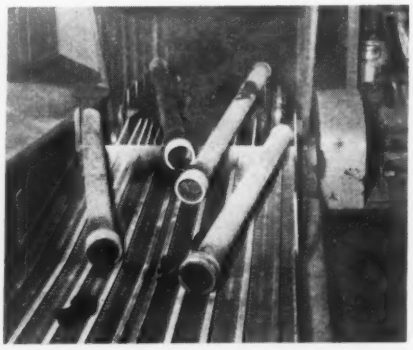
Soil Pipe Production Methods

QUESTION We operate a small foundry in Chile and would like to know the most suitable procedure for producing cast iron soil pipe. Average monthly consumption is about 7000 of 2-in. diam, 3800 of 3-in., and 4200 of 4-in. pipe. We also manufacture 5 and 6-in. pipe but only in small quantity. We use the centrifugal process employing metal molds lined with sand. Major difficulty and cost of production is due to making the molds in a rudimentary fashion by hand and the number and variety of molds which must be maintained, particularly when they have to be dried. Use of dried molds eliminates further treatment of the pipe. We also make all the fittings for the pipe. While our foundry is small and employs antiquated systems, we are making studies for projected modernization by degrees in a rational manner as dictated by working conditions in this country.

ANSWER While many foundries in the United States are producing soil pipe by hand and machine molding methods, some are employing the centrifugal casting process. The names of manufacturers of such equipment may be found in the advertising pages.

Choice of method, of course, depends upon a number of factors, including the cost of equipment. Hence, you will have to obtain that information and other data relating to production, etc. so that it can be compared with your present procedure. When all of the cost figures on the present and projected methods have been accumulated, you will be in a position to decide which is the most suitable for your present conditions.

At the same time, you should try to ascertain future possibilities, particularly with reference to increasing product demand and the labor situation, since they may be important factors in making the choice.



Soil pipe is produced by hand, by machine molding and centrifugally

Has Trouble with Copper Tube

QUESTION We are trying to enclose entirely a coiled copper tube in an aluminum casting made in a cast iron mold which cools the aluminum rapidly, but our experience has been that at various times the tube collapses although we do not pour directly on it. At present, preparatory to casting we clean the coil with carbon tetrachloride and then coat with water glass. Melting point of the copper is approximately 1800° F and we pour the aluminum at 1150 to 1175° F. Tubing has inlet and outlet exposed and the wall thickness of the aluminum around the coiled tubing is approximately ¼-in. Can you suggest an alternate quick coating other than water glass which would insulate the tubing during the pouring operation, or a better procedure which will whip this problem?

ANSWER While it is possible that a thin wash coating of whiting or refractory clay suspended in water with a small amount of water glass to aid suspension would be a better insulating agent than water glass, we believe that a more satisfactory procedure would be to fill the coil with dry clay-free silica sand such as fine core sand, plugging the ends of the tube to hold it in place. The sand being dry and free from clay will not cake or bake at temperatures much higher than those involved, and can be easily poured into the tubing before pouring and out of the tube after the aluminum is poured around it. Water cooling is another possibility, but would require care to see that leakage around connections did not cause trouble.

Surface Treatment for Alloys

QUESTION We will appreciate receiving information on how to anodize aluminum castings to keep them from turning dark, and how to oxidize bronze castings to darken the background on plaques before grinding the faces of the letters.

ANSWER Anodizing of aluminum is accomplished by electrolytic treatment in baths containing oxalic, sulphuric, phosphoric, chromic or sulfamic acids. The work is cleaned carefully and made the anode in the particular acid bath, and subjected to the action of direct current ranging from 5 to 60 volts which will provide an amperage of 6 to 60 amperes per sq ft of cathode area. It is our understanding that most of the procedures are covered by patents; we suggest that you get in touch with the large producers of aluminum for information.

Common method of obtaining a brown-to-black coloring on brass and bronze which is termed "oxidation," but actually is sulphidization, is accomplished by immersing the casting in a dilute solution of ammonium polysulphide. Casting must be as clean as possible to insure uniform coloring, and preferably should be degreased first by use of suitable agents or immersion in a boiling 5 per cent caustic soda bath for 15 minutes.

Casting is removed and rinsed thoroughly in running water. Then it is immersed in a dilute nitric acid bath composed of 1 part commercial acid diluted with 50 parts water, for 5 minutes. Again it is rinsed thoroughly in running water and then hung in the coloring bath, preferably by a string, until the desired color develops. Coloring bath may be made of 20 per cent commercial ammonium polysulphide diluted with an equal volume of water. The piece then is dried by tumbling in sawdust.

A variation of the coloring step which is recommended by some is to

immerse in the coloring bath for a short period of time, remove and rinse thoroughly. Then the casting is dipped in a 2 per cent sulphuric acid solution and rinsed thoroughly. The steps are repeated until the desired color is obtained. It is believed that this procedure gives a denser and more strongly adhering coating than with the single immersion process. For added protection the background color should be coated with clear lacquer.

Melting Iron in the Cupola

QUESTION We are operating a cupola lined to 54 in. Charges weigh 2000 lb and are made up of 500 lb pig, 800 lb returns, 550 lb purchased scrap and 150 lb steel scrap. We hold our coke bed from 50 to 55 in. at the beginning of charging operations. We use an air control unit and start with 6000 cfm to get hot iron as soon as possible, cutting it back to 5800 cfm after the first half hour of melting. We want an iron temperature of 2700 to 2800° F at the spout.

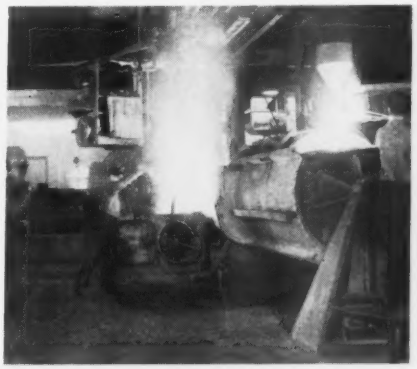
We used to use 270 lb coke per charge and invariably the temperature dropped to 2640 to 2700°F after 2½ hr of operation, making it necessary to add an extra 300 to 400 lb coke to get the temperature back. Consequently, coke splits were increased to 280 lb and now our temperature remains at the desired point. However, some in our organization claim that 280 lb coke is too much and causes metal oxidation from having the bed too high. Can a high bed cause oxidation? Is this too much coke per charge? What is the highest temperature that can be obtained in cupola melting of iron?

ANSWER We suspect that your previous trouble in maintaining metal temperature was due to your blowing with an increased volume of air at the beginning of the heat; we recommend that the cupola be operated on a constant volume—perhaps at the 5800 cfm rate since, presumably, that gives a satisfactory melting rate.

With the proper bed height, air blast and coke splits you should be able to start off with hot iron and maintain it in that condition throughout the heat. We suspect that the reason for blowing at a higher rate at the beginning of the heat is due to the bed being higher than necessary. Usual bed height for a 54-in. cupola is from 45 to 51 in. For good operation it should be maintained at some definite figure, and not 45 in. one day and 51 in. the next, etc. According to *The Cupola and Its Operation* the bed height should range from 10½ times the square root of the blast pressure to that value plus 6. In other words, if the blast pressure is 16 oz, the bed height might range from 42 to 48 in.

Best procedure to establish the most suitable bed height is to select a height as indicated and leave the tap hole open. After the wind is turned on, a steady stream of hot iron should flow through the taphole within 8 to 10 minutes. If the time is longer, accompanied by a dribbling stream of cold iron, the bed is too high. If the interval is shorter and a fair-sized stream of cold iron appears, the bed is too low. These indications permit the bed height to be adjusted until desired conditions are obtained. Then the bed height should be maintained at that level.

Your present iron-to-coke ratio of 7.1 appears to be only slightly lower than the previous ratio of 7.5 and



Careful control followed in cupola operation provides uniform results

falls in line with Mulcahy's statement: "When conditions permit—that is, with good material, size and other factors in proper balance—an average gray iron mix will require about 275 lb coke to melt 2000 lb iron. This quantity will permit a fairly fast melting rate, commensurate with the cupola diameter and generally will produce melting temperatures of 2800°F plus. When steel is used in the mix, an additional 3 lb per 100 lb of steel is required."

So far as we know, a high bed is not associated with the condition termed "oxidation," which commonly is mentioned in connection with low cupola beds. It generally causes a longer time for metal to appear at the spout, and the iron remains cold until the excess coke is burned away to establish the proper combustion zone.

Frankly, we do not know what might be the highest temperature attained in cupola melting. W. W. Levi in *Transactions*, AFS, 1952, mentions an average temperature over a period of 3½ hr of 2941°F in a basic-lined cupola operating with hot-air blast. We also have seen references to 2850°F for other cupolas. It might be pointed out that temperature in the melting zone of the cupola is estimated to be around 3000°F, and with a shallow depth of coke below the tuyeres, and the taphole open, temperature loss would be less than where there is a considerable depth of coke, or where the iron is held in the cupola well for any period of time.

Using Ethyl Silicate Binder

QUESTION In the September issue of FOUNDRY, Question and Answer Department, reference was made to making ceramic molds using ethyl silicate as the bond instead of cement. We are interested in this process and would like to know if you can tell us the name of the manufacturers of that material. Also the article does not give the precentages of silicate and sand.

ANSWER At present three types of ethyl silicate are available. They include tetraethyl orthosilicate, condensed ethyl silicate and 40 per cent ethyl silicate. The material is hydrolized for use by adding denatured alcohol and water containing a small amount of hydrochloric acid, and preferably should be allowed to age for several hours before use. The hydrolized stock solution will keep for about a week or more before gelling.

While a number of solutions can be made, a suitable one is composed of 60 per cent condensed ethyl silicate, 32 per cent denatured ethyl alcohol (95 per cent) and 8 per cent water containing about 1 per cent hydrochloric acid. The percentages given all are by volume, and a simplified solution would be 7.5 qt condensed ethyl silicate, 4 qt alcohol and 1 qt water containing 5cc hydrochloric acid.

In actual use to prepare the investment more water must be added to the stock or hydrolized solution so that the setting or gelling time is decreased to a reasonable value. For example, a setting time of 50 minutes at a temperature of 68° F may be obtained by adding 6.5 volumes of water to 100 volumes of stock solutions or 2 oz of water per qt of stock. The amount of this prepared solution to be added to the sand or refractory material will depend upon the consistency desired in the investment, and usually has to be in a pourable slurry state to conform closely to the pattern with application of vibration to consolidate the mass. Keep in mind.

however, that no more liquid or solution should be used than to provide proper flow and packing of the investment. While the ratio of binder or solution to dry investment will vary according to particle size of the investment, it usually is about 100 cc to 1 lb of dry investment.

In practice the pattern to be invested is coated with a suitable release agent such as a wax-base material, surrounded by a suitable flask which also must be coated or lined with wax or waterproof paper if it is not to be a part of the mold. Desired parting line, of course, must be established on the pattern first. Pattern and flask then are placed on a vibrator plate and the investment poured into the flask with the vibrator in action. Depth of the investment above the highest point of the pattern should be about 2 in.

Vibration is continued for about 20 minutes to insure proper compaction of the investment against the pattern face. During that period the excess liquid rises to the top, and eventually sets to a gel. When that occurs it indicates that the binder in the investment also has gelled. The excess material is cut off. Other steps in mold making are described in the previous discussion in the September issue.

It might be pointed out that the dry investment material should contain around 0.5 per cent MgO by weight to neutralize the hydrochloric acid in the binding agent.

Flame Hardenable Cast Iron

QUESTION Will you please give us the analysis of gray iron which has proved best for flame hardening to a hardness of approximately 500 Bhn? If alloys improve the flame hardening qualities, please state which alloys and the percentages involved.

ANSWER Due to variations from foundry to foundry, practices and compositions which are satisfactory in one may not be so in another. Also, composition must be related to section size or thickness, and one suitable for ½ or 1-in. section will not serve for one that is 3 or 4-in. thick. Both plain and alloy cast irons can be flame hardened; usually the latter are preferred because they can be treated over a wider range of temperatures, and the depth of hardening as well as the final hardness may be increased. In general, it appears that most satisfactory results in flame hardening are obtained with low-silicon, low-carbon irons which have a predominantly pearlitic structure.

Indications are that plain gray iron with about 3 per cent total carbon, 1.7 per cent silicon and 0.60 to 0.80 per cent manganese will provide a surface hardness of 400 to 450 Bhn when flame hardened, but hardnesses over 500 have been obtained on irons of somewhat similar composition. There is no doubt that the flame hardening practice has a bearing on the results obtained.

It appears to us that for ease of control and obtaining consistent results it would be advisable to use an alloy iron for flame hardening. Possibly an addition of around 0.30 per cent each of Ni, Mo and Cr might serve, but here again the question of section size, properties desired in the casting aside from the surface, etc. will have a bearing.

Binder in Investment Process

QUESTION We are in need of an investment binder for molding of ferrous and other high-melting-point alloys necessitating ability to withstand severe temperatures in the burn-out process. The binder must be soluble in water and remain soluble until the investment is poured. It then must undergo a chemical or physical reaction so that it becomes essentially insoluble. After becoming insoluble it should be capable of taking up the excess water so that the mass becomes solid and dry to the touch. It should set a few minutes after pouring.

Investment material must be fluid enough to flow around the pattern

ANSWER We do not know of any binding material for the type of investment molding you mention which will meet all of the stated conditions. The nearest approach to such a binder is ethyl silicate. Your reference to setting a few minutes after pouring the investment seems somewhat out of line in view of the usual practice of vibrating the mold for a considerable period of time to insure proper compaction of the investment around the pattern.

To provide an investment of suitable consistency so that it may be poured satisfactorily to flow around the pattern properly, an excess of liquid must be present. Some of it, of course, enters into the reaction to provide the "hardening" process, but the remainder still is present as a liquid and must be allowed time to evaporate. We believe that ethyl silicate will suffice for your application and we suggest you write to the manufacturers for information.

Small Holes Due to Core Gas

QUESTION We are forwarding a gray iron door-closer case as well as several pieces of one that has been machined. You will note the small pinholes on the small opening of the casting which has to be machined and threaded—usually resulting in leakage. Most of the pinholes do not show up in the rough casting prior to machining. Iron contains 2.10 to 2.20 per cent silicon, 0.60 to 0.80 per cent manganese, 0.40 to 0.50 per cent phosphorus, and 0.07 to 0.09 per cent sulphur. Casting is made from a matchplate containing two patterns in a 12 x 16-in. flask with 5-in. cope and 6-in. drag. Dry sand core is made with a resin binder and the mix consists of 100 qt dry silica sand, 1½ qt cereal binder, 2 qt resin, 4 oz release agent, 1 qt kerosene, and 6 qt water. There seems to be a difference of opinion as to the cause. Some feel that it is due to moisture in the core caused by improper baking, and others feel it results from an excess of cereal.

ANSWER Examination of the separate pieces and a number of others obtained by fracturing the casting indicates that the pinholes are caused by gas. It is not due to gassy metal since the holes appear only at the end of the small opening, as you mention. While the holes have a bright surface, indicating they are not formed by steam or moisture, they additionally have a shiny deposit on the surfaces of the holes; this is indicative of carbonaceous material. Consequently, our opinion is that the pinholes result from core gas which, being unable to escape through the print at the particular location, tries to exit along the edge of the mold cavity and kicks into the casting.

Remedy, of course, is to see that the core is vented to the outside of the flask. Possibly the sand is rammed harder in that area at some times than others, resulting in appearance and disappearance of the trouble where one is depending upon the permeability of the molding sand to carry away the gases. A positive vent will avoid that problem.

So far as we can ascertain, your core mix seems in line with the accepted range of suggested mixes. Computation by weight indicates 0.70 per cent actual resin, 4.1 per cent moisture, 0.42 per cent cereal and 0.07 per cent release agent. If the core ingredients or permeability were at fault, you would have core blows.

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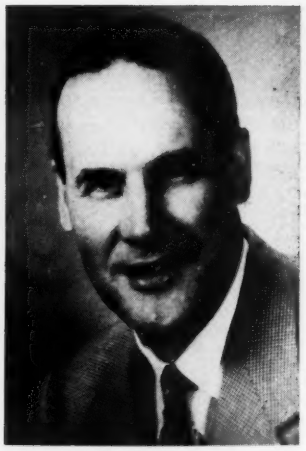


C. DON HICKS
. . . Michiana Products v. p.

HOWARD F. TAYLOR, professor of metallurgy and director of Massachusetts Institute of Technology foundry laboratory, has been designated occupant of the newly established American Brake Shoe Co. chair of Professor of Foundry Metallurgy at the institute. Establishment of the professorship recognizes the work of Prof. Taylor who has infused into foundry engineering the spirit of scientific methods and research. American Brake Shoe Co. and MIT were pioneers in applying the principles of engineering to metal casting. Prof. Taylor was graduated from Michigan State College where he remained as an instructor in the foundry and metallurgy departments. In 1937 he went to Naval Research Laboratory, Washington, where he became head of steel casting research. He joined MIT in 1945 and was awarded the Peter L. Simpson Gold Medal of the AFS in 1946 for his interest in and contributions to foundry research and influence in broadening naval research in cast metals. In 1948 he received the Army-Navy Distinguished Civilian Service Award.

Daniel J. Sheehan was appointed general parts and service manager with headquarters in Hyster Co.'s home office, Portland, Oreg. He joined the Danville, Ill., plant in 1946. **James L. Woodley,** who has been at the Portland plant for two years, was made manager at Danville. He has been with the company since 1945.

J. B. Arthur, founder and president, Mexico Refractories Co., Mexico, Mo., was honored Sept. 17 on the occasion of the company's 25th anniversary. A plaque commemorative of his leadership was presented by 16 men continuously associated with him since the company's beginning. Mexico Chamber of Commerce also presented a plaque at a dinner in Mr. Arthur's honor.

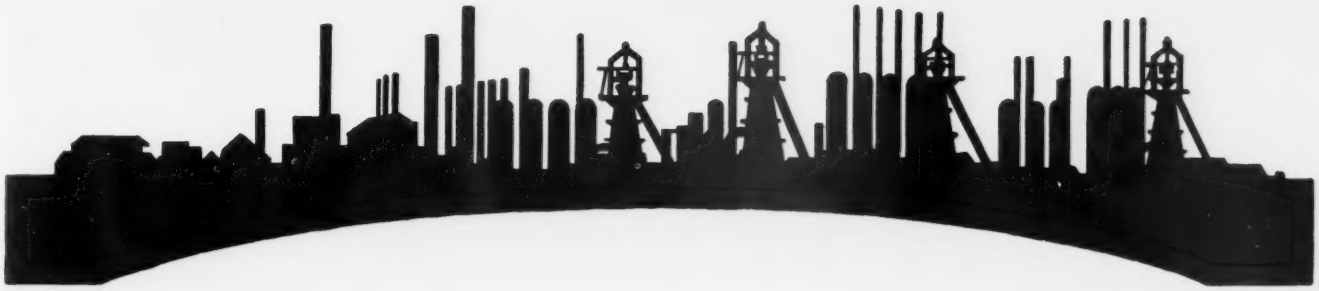
Anthony J. Derrick, formerly associated with American Brake Shoe Co., New York, was named manager of the foundry department, Kennedy-Van Saun Mfg. & Engineering Corp., Danville, Pa., where he will be in charge of production and sales. Experienced in the production of Meehanite castings at Brake Shoe, he will be supervising their production at Kennedy-Van Saun.

Robert T. Scott was named public relations director, Material Handling Institute Inc., Pittsburgh, in charge of development and writing of case histories, industry news, and co-ordinating advertising and publicity for the institute's exposition in 1956. A graduate of Fordham University, Mr. Scott, until recently was associated with Westinghouse Electric Corp.'s information services department, Pittsburgh.

William Ember, former owner of Jefferson Brass Foundry, Brooklyn, N. Y., retired recently. Bushwick Brass Foundry Inc. has acquired Mr. Ember's foundry.

C. Don Hicks was named vice president-operations, Michiana Products Corp., Michigan City, Ind. A graduate of Wayne University, he was formerly associated with Eaton Mfg. Co., Detroit.

Arthur P. Siewert was named superintendent of the gray iron foundry department, Danville, Ill., plant, Central Foundry Division, General Motors Corp. He succeeds **Arthur J. Karam,** who was transferred to the division's Defiance, O., plant as coreroom superintendent. **Ralph Anderson** has replaced Mr. Siewert as plant metallurgist at Danville, and **Joe Joseph** was transferred to the Defiance plant as coreroom general foreman. **Benjamin S. Head,** for the past year general foreman of the Defiance foundry department, was made superintendent of the finishing department there. Mr. Siewert went to Danville in 1949 from the Defiance plant. In 1947 Mr. Karam joined Saginaw Malleable Iron plant, Saginaw, Mich., and transferred to Danville in 1952, becoming superintendent there last year. Both men are graduates of Michigan College of Mining and Technology. Mr. Anderson, graduated from Purdue University in 1951, entered plant training at Danville, where until recently he was laboratory general supervisor. Mr. Joseph joined the Danville plant in 1950 following graduation from University of Illinois. He became general foreman in the core department and in January was assigned to the malleable



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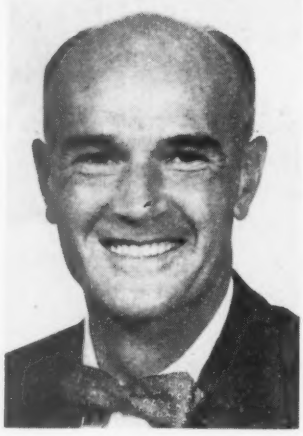

EDWARD L. PENN
. . . joins Shallway Corp.

IVAN E. HOWARD
. . . joins Lamson Mobilift

LEWIS T. CROSBY
. . . NEO chapter chairman

core and crankshaft program. Since July he was general foreman in the gray iron foundry. Mr. Head, a graduate of United States Naval Academy, became general foreman in the inspection department at Defiance in 1951, and was made general foreman of its foundry department last year.

W. Stewart Scott, vice president, Pittsburgh Coke & Chemical Co., Pittsburgh, has obtained an extended leave of absence from active duties due to ill health. In 1929 he joined Davison Coke & Iron Co., company predecessor, and rose from pig iron salesman to sales manager. He became vice president-sales in 1947, relinquishing the title of chief sales executive in 1953 because of health reasons. **George E. Dignan,** since 1943 vice president-operations, has retired from the company after 26 years of service. Also previously associated with Davison Coke, he became works manager of Pittsburgh Coke in 1940. Mr. Dignan plans to do consulting work for Pittsburgh Coke and other industrial firms.

N. P. Synnestvedt was appointed plant manager, and **J. G. Maurer,** shop superintendent, Manistee Iron Works, Manistee, Mich., division of Michigan Tool Co., Detroit. Associated with Michigan Tool for 20 years, Mr. Synnestvedt was in charge of its purchasing activities. Mr. Maurer, with Michigan Tool since 1944, was service manager for the past two years.

G. R. McWane has joined American Crucible Products Co., Lorain, O., as plant engineer, where he will be in charge of a new building layout for its Kenco Pump Division. He was associated with Sandusky Foundry & Machine Co., Sandusky, O., for 20 years in sales and engineering.

Edward L. Penn, formerly coreroom foreman, Pan American Alloys Inc., New Orleans, was appointed Shalco field service engineer in the Southwestern States by Shallway Corp., Connellsville, Pa. He will cover Missouri, Kansas, Nebraska, Texas, Oklahoma, New Mexico and Colorado. Previously he was associated with Walton East Branch Foundry Corp., Walton, N. Y., and later with Penn-Scott and Robertshaw-Fulton Controls companies.

Ivan E. Howard, since 1951 general service manager, Clark Equipment Co., Battle Creek, Mich., was appointed Cleveland district manager, Lamson Mobilift Corp., Portland, Oreg., to handle sales of the company's fork trucks in western New York, western Pennsylvania, Ohio, Kentucky, West Virginia and Michigan. Before joining Clark in 1951, he was associated with Hyster Co., Portland, Oreg.

John E. McCausland was named to the sales management staff, R. G. LeTourneau Inc., Longview, Tex. A graduate of Washington and Lee University, previously he was with the Adams Division of LeTourneau-Westinghouse Co. where he was district manager in charge of sales in New York and the New England states.

Robert W. Hildebrandt was appointed sales representative in Los Angeles, Laclede-Christy Division, H. K. Porter Co., St. Louis, succeeding **W. F. Doolittle.** A graduate of University of Southern California, previously he was a sales representative, General Electric Co., Schenectady, N. Y.

Leo Lofts, for 35 years foundry supervisor, Hoskins Mfg. Co., Detroit, is retiring.

Lewis T. Crosby, elected chairman of the Northeastern Ohio Chapter of the AFS for 1955-56, is manufacturer's representative, Sterling Wheelbarrow Co., Rocky River, O. A native of Detroit, he attended school there, at Culver Military Academy, later studying metallurgy through International Correspondence School. From 1925 to 1934 he was associated with his father at Detroit Electric Furnace Co., Bay City, Mich., and for 6 years was engaged in construction material sales with Western Waterproofing Co., in Kansas City, Mo., joining Sterling Wheelbarrow Co. in 1940. A former member of the Detroit Chapter of the AFS, Mr. Crosby has served as a director, second and first vice president of the Northeastern Ohio Chapter.

Cecil R. Garland, secretary, W. O. Larson Foundry Co., Grafton, O., is the new chairman of the Northeastern Ohio Management Group, Gray Iron Founders' Society, Cleveland. Other officers elected by the group, all associated with Cleveland foundries, include: **Lloyd W. Leesberg,** Superior Foundry Inc., vice chairman; **Kenneth Kadow,** Acme Foundry Corp., treasurer; and **W. N. Stoney,** Cleveland Foundry Co., secretary.

John M. Roberts, formerly secretary-treasurer, Patterson Foundry & Machine Co., East Liverpool, O., was elected executive vice president. **Dean M. Wilhelm,** vice president, is also technical adviser. **Thomas G. Coyne,** previously with Pittsburgh Plate Glass Co., Pittsburgh, recently joined the company as controller.

Shaochi Huang and **L. F. Spencer** were appointed research metallurgists, Allis-Chalmers Mfg. Co., Milwaukee. Dr. Huang is a graduate

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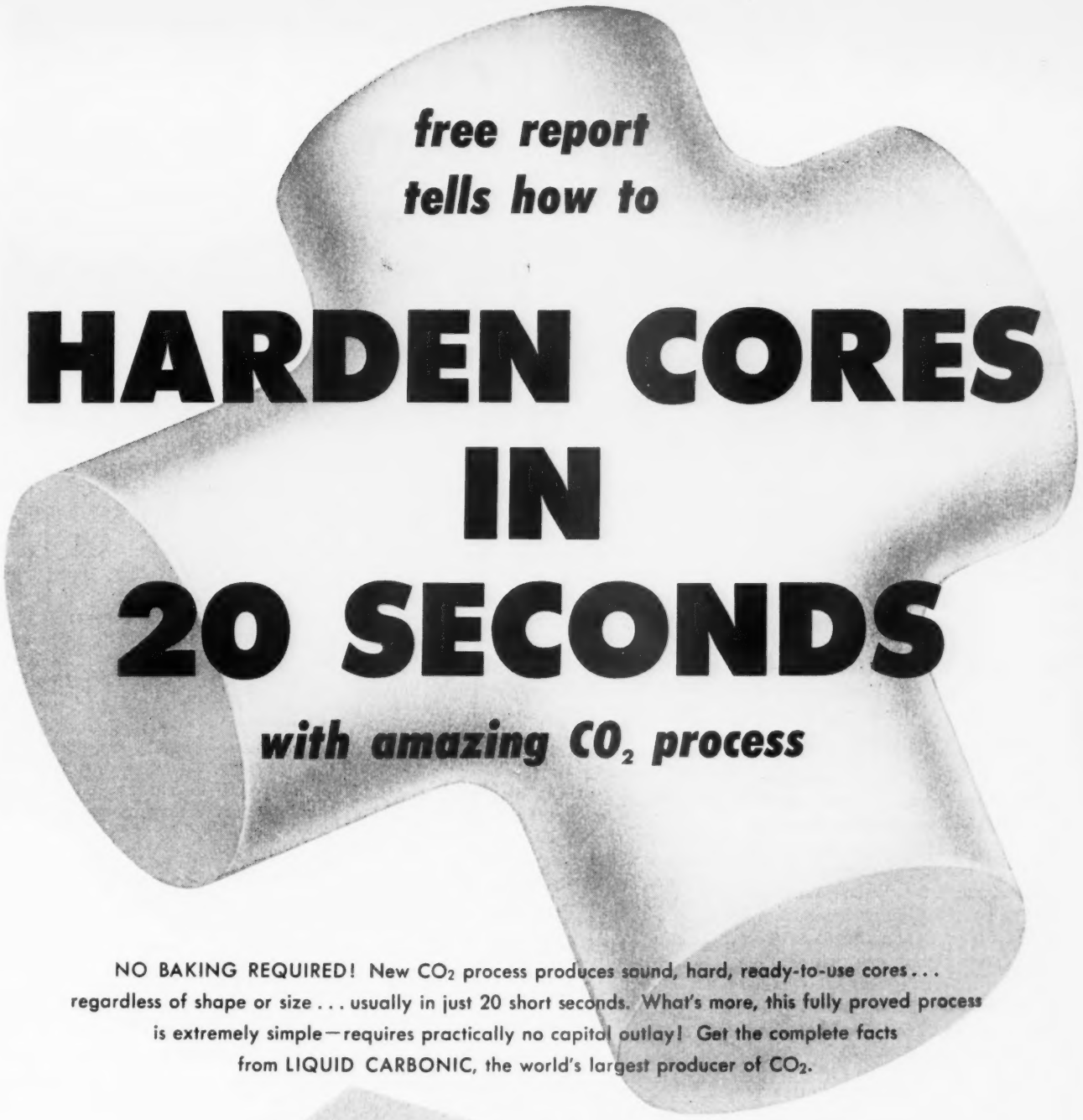

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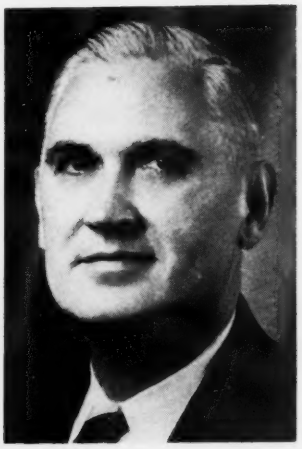
JOHN WOLFE
. . . Pioneer Foundry v. p.

DONALD L. CREWS
. . . research, J. B. Clow & Sons

BURTON G. EBBESON
. . . district sales, Norton Co.



H. C. STIRLING
. . . heads Pittsburgh founders

of National Central University, Nanking, China, and of Illinois Institute of Technology. Mr. Spencer, a graduate of Marquette University and University of Wisconsin, until recently was associated with Naval Research Laboratory, Washington.

John Wolfe was made vice president-sales, Pioneer Foundry Co., Jackson, Mich., producer of gray iron and alloyed iron castings.

William Bohrer was appointed sales engineer in the Cleveland office, Wheelco Instruments Division, Barber-Colman Co., Rockford, Ill. **Vincent Piedmonte,** formerly of the Cleveland office, was made Wheelco branch sales manager at the Barber-Colman Ltd. of Canada office in Toronto. **James Hind** has joined the Syracuse, N. Y., office as sales engineer, and **Glenn Fann** was named service engineer in the Rockford area.

Richard C. Campbell, formerly sales-metallurgical engineer, Watson-Flagg Machine Co., Paterson, N. J., was appointed in that capacity with Metal & Thermit Corp., New York. Mr. Campbell was graduated from Newark College of Engineering and is presently working on his master's degree at Stevens Institute of Technology.

Erwin J. Campbell was appointed supervisor of process research, Research and Development Department, Acheson Colloids Co., Port Huron, Mich. He was graduated from University of Michigan and joined Acheson's research department in 1945 as product development chemist.

P. C. Will recently resigned as vice president - engineering, Hydro - Blast Corp., Chicago, and has joined Edwin Hancock Engineering Co., Chicago.

Donald L. Crews was appointed director of applied research and development, James B. Clow & Sons, Chicago. Mr. Crews was formerly associate professor of metallurgical engineering, University of Cincinnati. Previously he was associated with A. O. Smith Corp., Milwaukee, the Richardson Co., Chicago, and General Motors Corp., Detroit and Flint, Mich.

Burton G. Ebbeson, for 2 years field engineer in the New England district, Norton Co., Worcester, Mass., was recently appointed district sales engineer there. He joined the company in 1936 after graduation from Brown University, and prior to transferring to sales engineering was in the manufacturing control, organic and research and development departments.

John P. Borda was appointed general manager, Magnus Metal Division, National Lead Co., New York. **Edward M. Van Winkle** was named president, Magnus Metal Corp., company subsidiary. Both positions were previously held by **William V. Burley,** also a vice president of National Lead Co., who has retired after 33 years of service.

Dr. Jacob O. Kamm was elected president, Cleveland Quarries Co., Amherst, O., as well as president of the company's wholly owned subsidiary, Silica Chemicals Inc. He previously was executive vice president of both companies. **Harold G. Leibold** was named sales manager of the company's refractory division.

Dr. David W. Levinson was recently appointed supervisor of nonferrous metallurgy research, Metals Research Dept., Armour Research Foundation of Illinois Institute of Technology, Chicago.

H. C. Stirling, recently elected president of the Pittsburgh Foundrymen's Association, since 1953 has been general superintendent, Rolls Division, Blaw-Knox Co., Pittsburgh. He began his apprenticeship in the foundry industry at American Bridge Division, U. S. Steel Corp., Ambridge, Pa., in 1920, and joined Blaw-Knox 23 years ago as patternmaker at Lewis Machinery Division, Groveton, Pa. While there he was pattern shop and general foundry superintendent and in 1951 became production superintendent in charge of castings. Mr. Stirling was vice president of PFA last year.

Augustine R. Marusi was elected a vice president, Borden Co., New York. Associated with the company for 16 years, he is also president of its Chemical Division. He started at the division's research laboratory in Bainbridge, N. Y. Mr. Marusi was director-superintendent of the company's Brazilian operation from 1947 until 1952 when he returned to New York as vice president of the Chemical Division.

John W. Becker was named manager of the Syracuse district, Allis-Chalmers Industry Group, succeeding **A. J. Mestier Jr.,** recently appointed Detroit manager. Mr. Becker joined Allis-Chalmers, Milwaukee, in 1948, after graduation from University of Nebraska.

Howard K. Chapman, executive vice president, H. Kramer & Co., Chicago, has been named president, succeeding **Lazarus Chapman,** who has become board chairman.

Dr. Samuel Zerfoss was appointed chief of the Refractories Section, National Bureau of Standards, Washington, following retirement of **R. A. Heindl.** Dr. Zerfoss was graduated

GREAT MOMENTS IN THE HISTORY OF IRON AND STEEL MAKING

Joseph Hall

A water-powered trip hammer forging a bloom started in the puddling furnace shown in the background. *This is the tenth in a series of outstanding inventions and developments that have contributed to the progress of the iron and steel industry.*

1830
Pig Boiling

Of the early developments in iron and steel production the puddling process has stood the test of time.

First conceived by Henry Cort as the "dry puddling" process and later modified by Joseph Hall's "pig boiling" process, it has remained essentially the same for a century and a half.

Hall's improvement was to eliminate the waste of iron, which at times ran as high as 30 per cent of the charge. He did this by substituting air cooled cast iron bottoms for the sand hearth lining and shortened the time of heat.

The key operational point in wrought iron manufacture is the pouring of molten refined iron into a bath of liquid slag to form a sponge-like ball of iron impregnated with liquid slag. This refined iron is defined as iron bars rolled from a box pile of muck bars and wrought iron scrap bars free from steel.

The extreme selectivity of a charge points up the importance of scrap of known analysis, a problem particularly suited to our experience, personnel, equipment and the strategic location of our offices. Possibly our facilities may help you solve a problem in iron or steel scrap.

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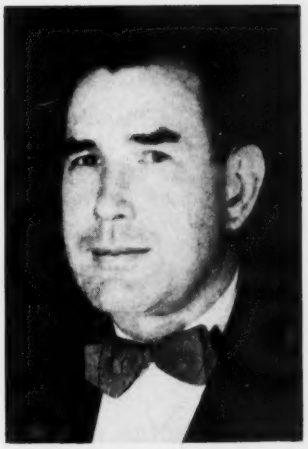
HARRY CZYZEWSKI
. . . Chairman, Oregon chapter

ANTON DORFMUELLER JR.
. . . ADM sales, Buffalo

EDWARD F. JENNINGS
. . . district sales mgr.



VIRGIL B. BULLEN
. . . Tocco Div. engineering

from Pennsylvania State University and prior to joining the bureau's staff in April, spent 8 years at Naval Research Laboratory, Washington.

Harry Czyzewski, elected chairman of the Oregon Chapter of the AFS for the current year, since 1947 has been manager, Metallurgical Engineers Inc., Portland. He was graduated from University of Illinois, where he was assistant professor of physical metallurgy from 1947 to 1951. Previously he was research metallurgist, Caterpillar Tractor Co., Peoria, Ill., from 1941 to 1946. Mr. Czyzewski was vice chairman of Oregon Chapter last year.

Dale Wright was appointed chief metallurgist, Caterpillar Tractor Co., Peoria, Ill., succeeding **Glen C. Riegel,** retired. **T. H. Spencer** replaces Mr. Wright as plant metallurgist, and **T. W. Pack** takes over Mr. Spencer's former position as heat treat manager. Mr. Wright, who joined the company in 1934, was formerly foreman and general superintendent of the heat treating department. Mr. Riegel served the company 29 years. Messrs. Spencer and Peck have been associated with the company for 19 and 26 years, respectively.

Joseph H. Parsons, since 1943 vice president in charge of industrial castings sales, Brake Shoe & Castings Division, American Brake Shoe Co., New York, has retired after 42 years of service. A graduate of Princeton University, he joined the Mahwah, N. J., plant as an apprentice shortly after graduation. He was transferred to the Melrose Park plant, Chicago in 1917, and in 1932 became secretary of the company.

Harold Bogart was appointed manager, Manufacturing Research Department, Ford Motor Co., Dearborn, Mich., succeeding the late Gosta Vennerholm. Mr. Bogart was formerly assistant to Mr. Vennerholm.

Anton Dorfmueller Jr. has joined Archer-Daniels-Midland Co., Foundry Products Division, Cleveland, as Buffalo sales representative, replacing **A. S. Coulter** who will retire early next year. Prior to his employment with ADM, Mr. Dorfmueller represented Koppers Co., Granite City, Ill., in the Midwestern territory and recently was associated with Thiem Products Inc., Milwaukee, in the Ohio and western Pennsylvania territory. He is a University of Wisconsin graduate.

Edward F. Jennings was named New York district sales manager, Laclede-Christy Co. Division, H. K. Porter Co., St. Louis. Mr. Jennings, who joined the company in 1934, will continue to supervise export sales which he has done since 1951.

Arthur J. Bukovich was named Boston district manager, Industrial Division, Harnischfeger Corp., Milwaukee. He joined the company in 1949 and served as sales engineer in Minneapolis and Boston. Other district managers appointed by the division include: Buffalo, **Paul Anderson Jr.,** who joined the Minneapolis office as sales engineer in 1942, before going to Buffalo; Birmingham, **Sidney S. Keywood,** with the company since 1936, and in the former Memphis, Tenn., office prior to serving in Birmingham; Pittsburgh, **Richard P. Schell,** a company employee since 1942, and in Pittsburgh since 1948; Detroit, **Stuart W. Trainer,** with the company since 1935 and in the Washington office prior to going to Detroit in 1953; Dallas, Tex., **Wayne H. Green,** with Harnischfeger since 1927 and joined the Dallas office the following year.

Henry F. Sulkowski now serves as a sales engineer in Minneapolis. He was a crane sales engineer in Milwaukee since 1953 and joined the company two years previously.

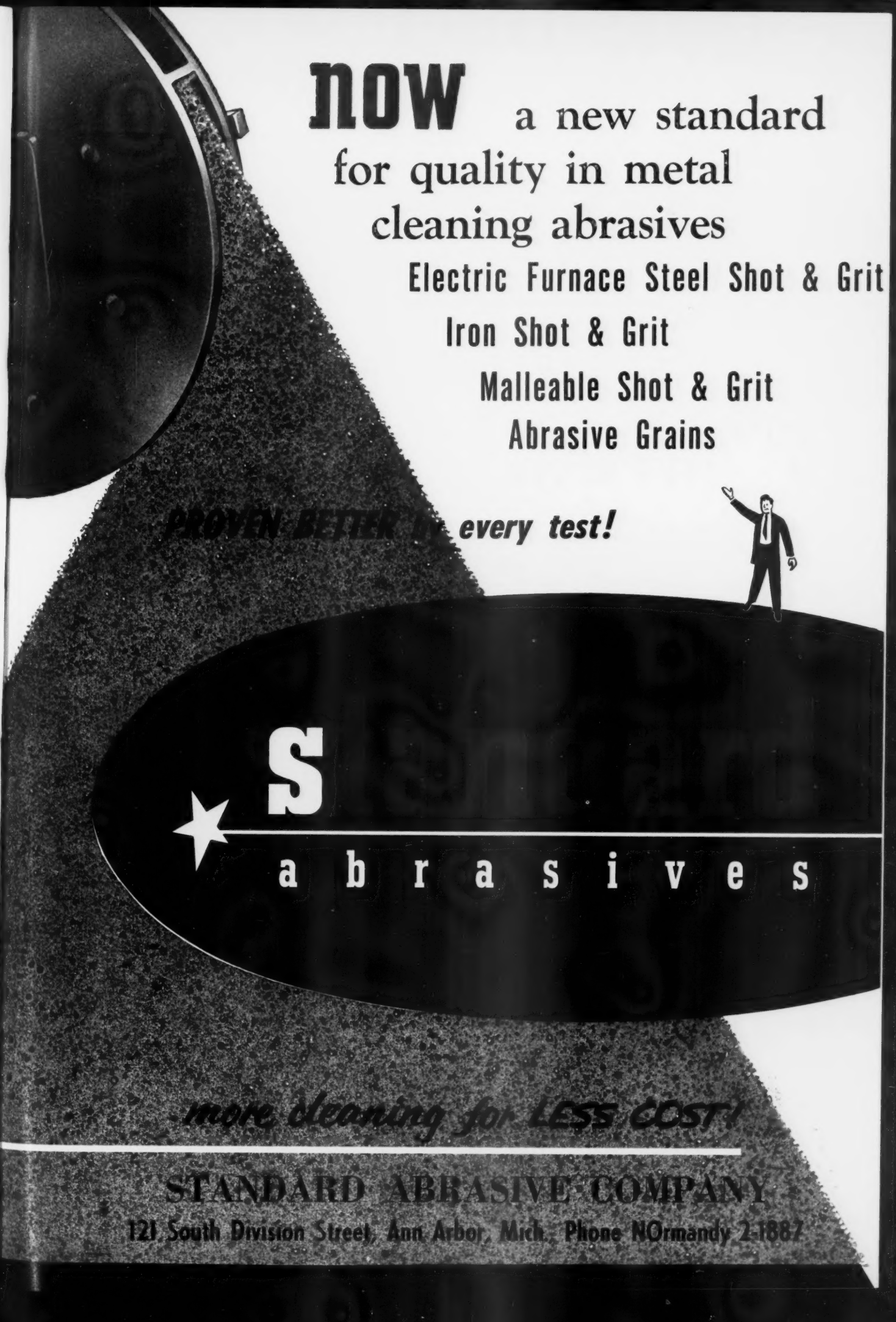
Virgil B. Bullen was appointed engineering representative, Tocco Division, Ohio Crankshaft Co., Cleveland. He will be located in the division's Chicago office to cover western Illinois, Missouri, Arkansas, Nebraska, Kansas and Oklahoma. Until recently he was superintendent of the process machinery laboratory, Cincinnati Milling Machine Co., Cincinnati.

William R. Heath, since 1953 vice president, Buffalo Forge Co., Buffalo, was elected executive vice president. He joined the company in 1922, after graduating from Cornell University, and became chief engineer in 1948. **George P. Schivley,** former plant manager, has succeeded Mr. Heath as director of manufacturing. He was graduated from Drexel Institute and joined the company in 1940.

Harry L. Artinger, for the last 10 years industrial service engineer, Pittsburgh, was named Pittsburgh branch manager, Thor Power Tool Co., Aurora, Ill., to serve most of the western half of Pennsylvania, southeastern Ohio and West Virginia. Mr. Artinger was previously with Heppenstall Steel Co., Pittsburgh.

Cecil N. King was named superintendent of foundry operations, Dodge Main Division of Chrysler Corp., Detroit. He was formerly manager of Dodge's Winfield Plant.

Clinton F. Zabriskie, foundry metallurgist, Sperry Gyroscope Co., Great Neck, N. Y., was recently appointed metallurgist, materials and processes.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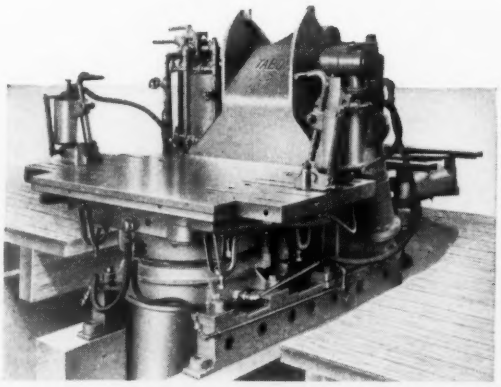
MOST foundry managers know that there's a point of no return in foundry equipment . . . when operating and maintenance costs of old equipment *outweigh* the cost of new equipment.

The low-cost producer—the man who makes a *better* casting *faster* at *lower* unit cost—takes action here.

- He does it by installing modern Tabor foundry machines—*designed* to be efficient multipliers of men's work.
- He does it on an individually planned job basis—a step-by-step mechanization program *without* big capital outlay.

Remember, it's the low-cost producer who makes the market, sets the price, gets the order, makes the profit.

Let a Tabor engineer show you how business has a way of going to the low-cost producer. There's no obligation. Catalog on request.



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A shockless 3000-lb. capacity unit. The rollover plate is 40" wide x 50" long . . . maximum draw is 15". This completely power-operated Rollover is only one of Tabor's family of foundry-proved units — ranging from 450 lb. to 3000-lb. capacity. Many special designs are incorporated in these machines — products of Tabor's 70 years of foundry experience.

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MISSOURI VALLEY FOUNDRYMEN MEET

Hold Regional Conference at School of Mines

By FRANK G. STEINEBACH
Editor

TWO hundred foundrymen, chiefly from the Southwest, attended the Missouri Valley Regional Conference at the University of Missouri, School of Mines, Rolla, Sept. 29-30. The conference was sponsored jointly by the School of Mines, the American Foundrymen's Society and the St. Louis, Mo-Kan, Tri-State and MSM Student Chapters of the society. During the meeting, visitors were privileged to inspect the well equipped foundry of MSM.

In welcoming those attending the conference, Dean Curtis L. Wilson, School of Mines and Metallurgy, paid tribute to the foundry industry for its active support of that institution. He said that members of the St. Louis Chapter meet with the student chapter at Rolla once a month, and that this helps materially in creating an active student interest in the industry.

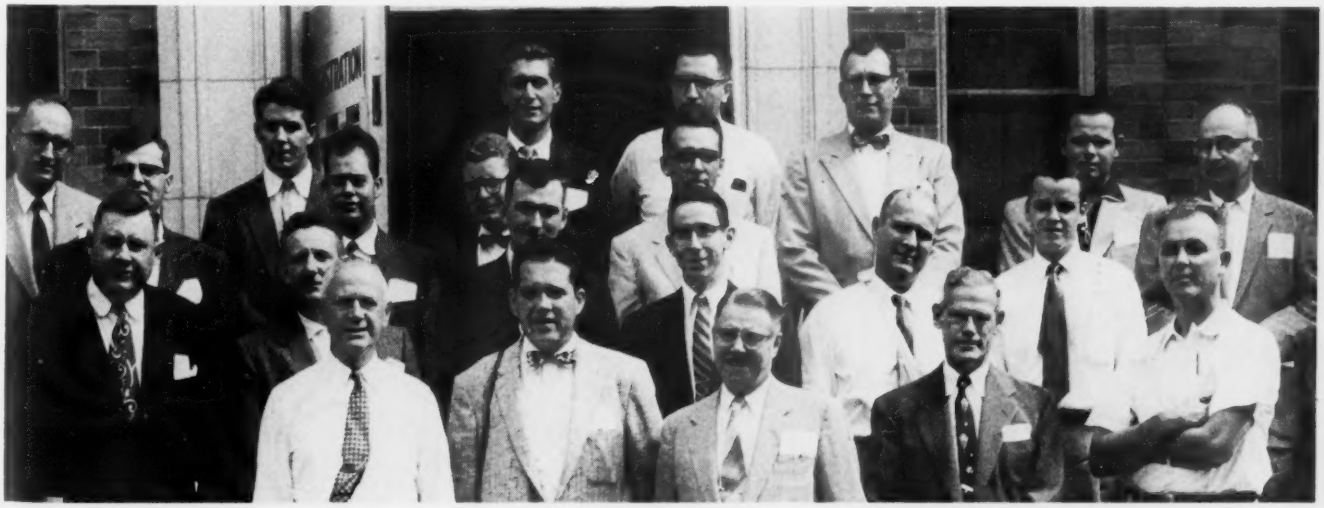
In a challenging talk entitled "New Horizons in Foundry Progress," Hans J. Heine, technical director, American Foundrymen's Society, predicted that progress during the next few decades will be along the lines of development of exploited metals, more effective use of currently common materials, improved properties and new processes and procedures. He indicated that more attention would be paid to use of materials for corrosion and wear resistance.

Mr. Heine stated that vacuum degassing treatments, such as may be applied in practical foundry operations by the use of mechanical pumps, effectively eliminate the gas problem. He referred to the work of the Naval Research Laboratory, (FOUNDRY, December 1954, p. 78) which proved that extremely tight systems are not necessary to obtain a degree of degassing required for commercial foundry practice. Progress in processes, including high-pressure molding, shell molding, the carbon dioxide process and core shooting, were discussed in some detail to illustrate progress.

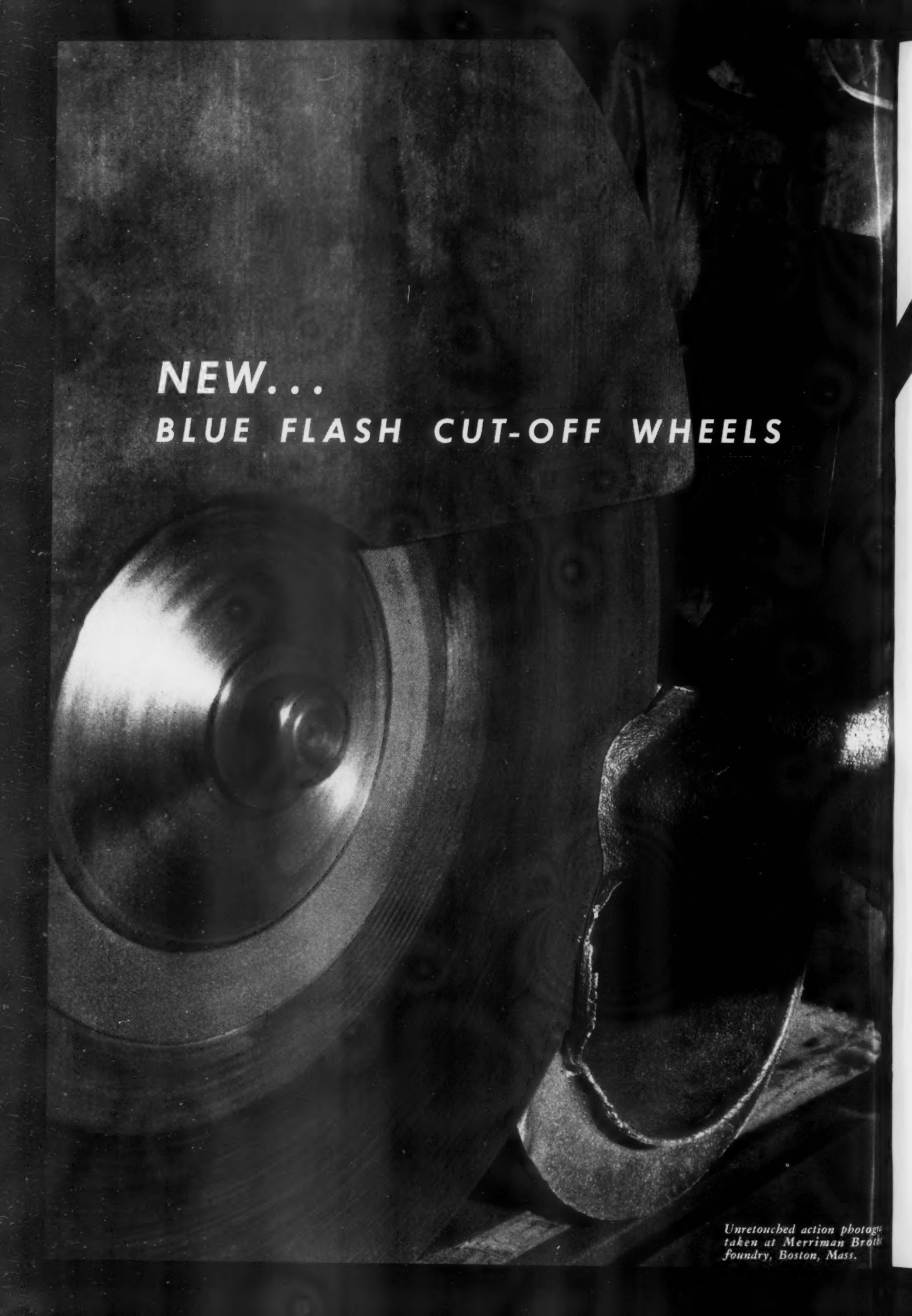
In conclusion, Mr. Heine stated that although mechanization and automation are with us to stay, men and women will still operate the giant machinery of our industrial organization. Supervisors will still have to encourage greater productive efficiency of the employee group as a whole, and executives will still have to co-ordinate personnel into a working team, define objectives and policies of their companies and develop an improved product. As the professional management man takes over the big jobs of the industry, the quality called executive ability is growing more and more important. Mr. Heine predicted that management, in the years to come, will get better acquainted with the procedures and benefits, as well as the limitations, to be expected from the use of certain psychological knowledge and techniques.

In introducing the discussion on "Can Shell Cores Help You," William J. White Jr., Shallway Corp., Connellsville, Pa., discussed the progress in the application of the shell mold process to the foundry industry. He showed the development of machines, materials, the greater interest of patternmakers in making shell mold patterns and the growth in size of castings produced. In that connection he stated that a western Pennsylvania steel foundry is now pouring a 420-lb steel casting in a 24 x 36-in. shell mold.

Although the speaker indicated that many advantages might be claimed for the shell process, he advised a careful analysis of each plant problem by one familiar with the process in order to provide an intelligent answer of whether or not shell cores should be considered. After showing slides illustrating a number of cores produced by the shell process, Mr. White indicated that the following questions should be



Many Missouri School of Mines alumni attended the conference. This view, in which several faculty members also appear, includes the following, from left to right in each instance: Front, George Mellow, Harry Ahl, Dean Wilson, Richard Mellow and William Walker. Second row: Dr. Eppelsheimer, James Schaffrodt, Jack Thompson, Ralph Johnson, H. J. Pfeifer and Robert Wolf. Third row: David S. Gould, Norman Peukert, William Sehnert, Charles Remington Jr., Clarence Richey and Dr. A. J. Miles. Back row: Dr. T. M. Morris, Albert Vigne Jr., Jack Bodine, William Ruprecht and George Mitch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Unretouched action photogr
taken at Merriman Broth
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The new "BLUE FLASH" bond and structure take full advantage of the cutting ability of each abrasive grain. The fast, free cutting action that results is boosted further by rough abrasive sides which practically eliminate binding, the cause of most chipping and breakage. Wheel speed stays high to cut *more* metal per unit of time at *less* cost in abrasive consumed. Cuts with BLUE FLASH are fast, clean, cool . . . and safe.

You depend on cut-off machine and operator for low cost cleaning room operation. But they can work no faster than the *wheel* that does the cutting. Now, "Blue Flash" wheels give both operator and machine new freedom to produce for profit.

These new "Blue Flash" cut-off wheels for foundries are strongly reinforced internally for rugged work on aluminum, bronze, cast iron, steel or alloys . . . one more example of BAY STATE'S famous "Wheels of Progress", serving industry everywhere.

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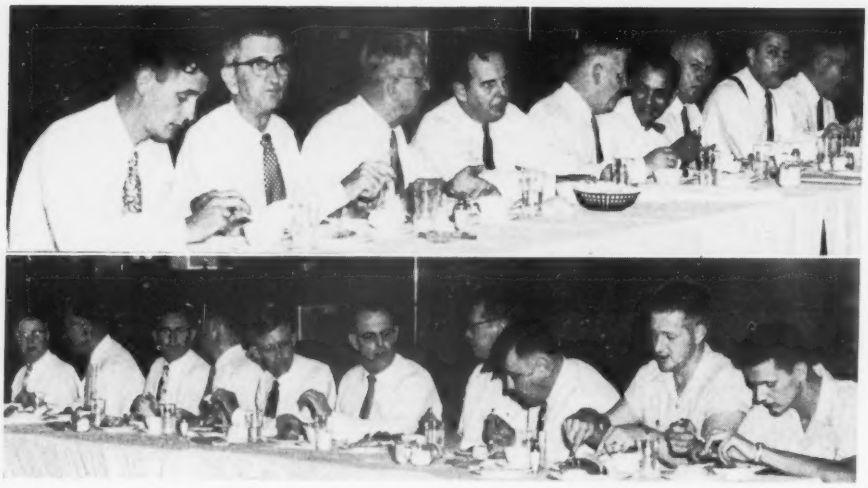


View of speakers table at luncheon on first day. Shirtsleeves were in order

asked to determine whether or not a particular job is adapted for use as a shell core: Will it save metal and subsequent machining? Will it produce a sounder casting where needed? Will it lessen the shakeout problem? Can hot tears be eliminated by greater collapsibility? Would it provide values by increased venting? Would wires and rods be eliminated? Would it be possible to get more core production in the same coreroom area? Of course, a good cost comparison should be made.

Speaking on "Practical Approach to Quality Control in the Foundry Industry," Charles F. Walton, technical director, Gray Iron Founders' Society, Cleveland, stated that the good old days are gone. Purchasers want consistent quality. Consistency, in his opinion, is more important than the actual level of quality, since stresses are being pushed up and designers are reducing many of the unnecessary high safety factors incorporated in previous designs. Designers are figuring their loads more closely to expected properties, so there will be trouble if the customer does not get what is expected. Furthermore, with incentive systems in most machine shops, castings must be clean and accurate or the story of a poor product builds rapidly and reaches the purchasing agent quickly.

Mr. Walton said that today's customer wants just the quality to meet his needs and will not pay for more than he needs and will not accept less. No foundry is immune to this trend since the customer must remain competitive in his own line of work. The speaker pointed out that in the last eight years of unprecedented prosperity, one-quarter of the gray iron foundries went out of business. While there are several contributing factors, the most important reason is the inability of the individual plant to keep up with progress.

Business methods that were entirely satisfactory a few years ago are not acceptable today. Quality is necessary and the principal requirement for a quality control program is that top management be sold on the need for consistent quality. What the customer wants is a quality product at a competitive price, and the competition must be with other forms of fabrication as well as with other producers of castings. After considering some of the factors necessary in a quality control program, Mr. Walton concluded with the statement that the road to mediocre castings is an easy one. As the foundryman raises the product to higher levels, the limits of variation become narrower and narrower. To be successful, skill is required in the operation.

William T. Bean Jr., foundry consultant, Detroit, criticized the foundry industry rather severely in his talk "Steel Casting Design." He stated that he had almost quit talking to foundrymen because either they do not believe him, or if they believe him they are too busy to do anything about it. Too many times in the design of castings, facts are not available, so that more material is added. Often this does not work out. In the speaker's opinion, we need to get more facts on materials and on shapes. The speaker stressed frequently that the test bar shows only the strength of that particular shape in tension. It does not indicate the physical properties of the casting.

Mr. Bean said that he is more interested in the integrity of the foundry than in the chemical analysis of the casting. Some organizations do a good job regularly. Some do it occasionally, and some, in his opinion, should not be producing anything but test bars. He has found that it is possible to produce a stronger part by putting the metal in the shape that it should be. He suggests the use of mockups as an aid in design. In conclusion, he stressed the fact that when the foundry sells a job on sound engineering principles and design, it stays sold.

R. A. Colton, Federated Metals Division, American Smelting & Refining Co., Newark, N. J., in discussing "Practical Gating and Risering of Nonferrous Castings," indicated that pouring practice as well as gating and risering, accounts for the greatest number of defects in aluminum and brass casting alloys. In brass castings, where the largest number of defects are due to gating, the system should be designed to minimize turbulence and agitation. In addition, local overheating at any portion of the mold or core should be avoided by careful distribution of the liquid metal within the mold cavity.

Recommends Multiple Ingates

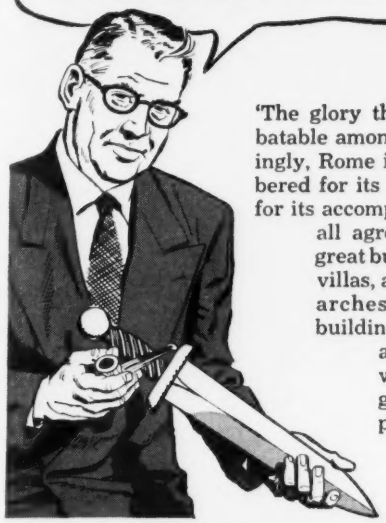
Mr. Colton recommended multiple ingates to minimize many of the problems created by running too much metal through a single gate. Bottom gating usually does not solve as many problems as it creates because of the distributed solidification pattern. Step gating does not work, according to the best experimental gating available. Use of a drag runner and cope ingate system has proved highly beneficial in controlling metal flow in the mold.

Mr. Colton stressed the fact that proper use of risers depends on understanding solidification of metals. Riser size and placement is a function of the type of alloy involved and rate of solidification of the section concerned. Since a riser is a reservoir of hot metal, it may delay solidification if improperly placed. Risers should not be used as vents and should be used only when there is some benefit to be gained. Chills to eliminate risers or to improve solidification characteristics, insulated risers to improve feeding, and hot topping of risers were recommended as valuable tools to the nonferrous foundryman.

At the general session on Friday morning, C. V. Nass, Beardsley & Piper Division, Pettibone Mulliken

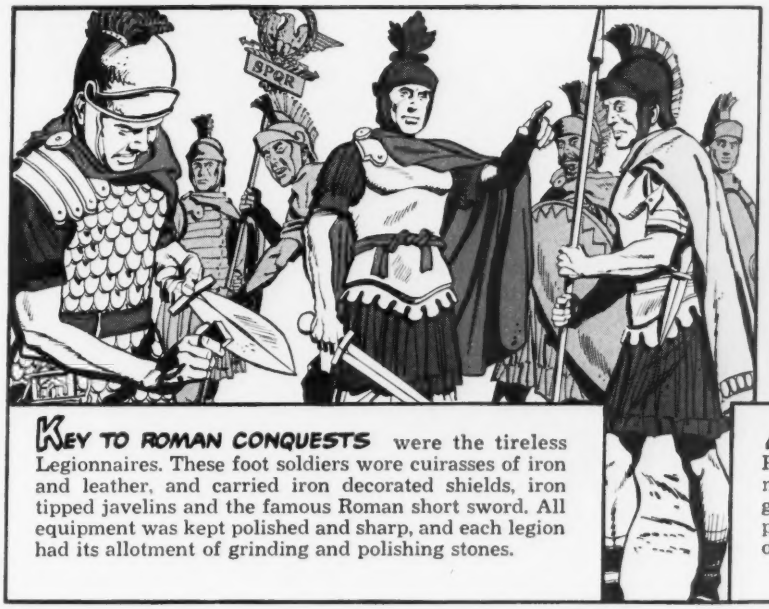
ABRASIVES WERE AN AID TO ROMAN *construction and conquest.*

NO. 5 OF A SERIES
ON THE HISTORY OF ABRASIVES
BY CHICAGO WHEEL & MFG. CO.



'The glory that was Rome' is debatable among historians. Surprisingly, Rome is more often remembered for its decline and fall than for its accomplishments. However, all agree the Romans were great builders. Their temples, villas, arenas, and triumphal arches testify to this. In building construction as well as in the weapons of war, abrasives and grinding played a part.

IN THE DAYS of the Empire, the principal building materials were stone, brick and cement. For the more important buildings slabs of marble were laid over the rough structure. The removing of burrs on stone, the smoothing of mortar and the grinding and polishing of marble was done with abrasive rock, sandstone and pumice.



KEY TO ROMAN CONQUESTS were the tireless Legionnaires. These foot soldiers wore cuirasses of iron and leather, and carried iron decorated shields, iron tipped javelins and the famous Roman short sword. All equipment was kept polished and sharp, and each legion had its allotment of grinding and polishing stones.

ABRASIVES were common to the Roman home. Pliny and Lucian wrote of metal mirrors, made of a mixture of copper and tin, which required frequent grinding to enhance their reflective quality. For this purpose a sponge full of powdered pumice-stone was often kept hanging near the mirror.

THROUGHOUT ancient history man depended on muscle power to grind, smooth and polish. Abrasion was a tough, time consuming occupation. The scientific approach to making abrasive wheels today, plus the high speed tools that operate them, have taken the time and labor out of grinding.

A new factor in the manufacturing of mounted wheels and points is Chicago Wheel's positive production control. This means mounted wheels and points can now be produced alike in every detail. There is no variance from one production run to another. In other words, if you used a particular wheel type for a job one month ago and now want another order, the new wheels will be exactly the same. You can imagine the advantage here in production grinding.

CHICAGO WHEEL & MFG. CO.

1101 W. Monroe Street, Chicago 7, Illinois, Dept. F

PROVE TO YOURSELF...

Chicago Wheel's positive production control. Write for test wheels to use in actual production. No charge.

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Dear Reader:

They're HERE (in this issue) ---- the editorial feature stories recently reported "coming up" for your reading pleasure.

PLASTER MOLDING (the "Antioch Process") ---------- page 100
HOW TO IMPROVE SOUNDNESS OF BRONZE CASTINGS ------ page 120
WHAT HAPPENS WHEN A CORE IS BAKED? --------------- page 128
USE AND FUNCTION OF CHILLS IN SAND MOLDS --------- page 162
MELTING PRACTICE IN THE BRASS FOUNDRY ------------ page 107
INVENTORY REPORT OF FOUNDRY MATERIALS HANDLING EQUIPMENT ---------- page 112

Were you aware that each issue of FOUNDRY brings you approximately 100 pages of editorial material?

In the months ahead, here are some of the feature stories planned for publication:

SHELL CORES -- what it takes in material and equipment for their production.

HOT STRENGTH OF SANDS -- interesting results of tests conducted by the British Cast Iron Research Association.

HEAT AND WEAR RESISTANT CASTINGS -- production practices of a small steel foundry.

INDUSTRIAL TRUCK OPERATION -- how one foundry's control system regulates traffic of its 15 power trucks.

COOLING FOUNDRY SANDS -- theoretical and practical aspects involved in cooling sand for reuse.

$15 (or more) IDEA! Associate Editor Bob Herrmann would be more than happy to have your ideas on "how to do it" of the "shop kinds" variety for illustration and publication. $15 (or more) is paid for all acceptable such "kinks." See Contents page (3) for location of the "HOW TO DO IT" in this issue.

FOUNDRY

Corp., Chicago, gave some sound advice in a paper "Practical Mechanization for Small Foundries." He stated that obsolete methods are just as damaging and costly in proportion to the small shop as the use of obsolete machines is to the highest production shop. Therefore, it is time for the small foundryman who has said, "I cannot afford to mechanize" to realize that he cannot afford not to mechanize, but only to the degree which is correct for his shop.

Mechanization is needed because labor is the most expensive commodity. This cost has increased tremendously in the last 25 years. Furthermore, the industry does not have the amount of skilled labor needed and foundry mechanics are not being produced. Therefore, leaving out the economics entirely, some labor must be replaced by machinery. To illustrate the point, Mr. Nass stated that if the foundry can increase the activity of a skilled laborer only 15 per cent, a $750 piece of equipment will pay for itself in one year.

Demand Improved Casting Quality

In addition to the economics of the situation, the demands for improved quality of castings dictates the elimination of the human element as much as possible. Obviously, certain processes such as shell molding, have made the casting buyer conscious of improved quality, and these customers will continue to demand improved quality of green sand castings without an increase in cost. In conclusion, Mr. Nass indicated that mechanization requires a sound study of the individual problem. It must have an over-all plan so that the money spent will be invested wisely and the equipment will provide savings to be applied to the continuation to the plant mechanization program. In a small jobbing foundry, flexibility is tremendously important. Since these shops have less capital to use, it is most important that the correct type of equipment be chosen in any mechanization program. In Mr. Nass' opinion, there is only one justification for mechanization—the production of improved quality castings at a lower cost.

In a talk on "Steel Castings vs. Forgings" J. B. Caine, foundry consultant, Cincinnati, said that if castings are to compete quality-wise with wrought metals, physical properties become one point of competition. Steel castings can compete in tensile properties as far as modulus of elasticity, yield and tensile strengths are concerned. They cannot compete on elongation and reduction in area. Fortunately, plenty of proof is available that although elongation and reduction in area underevaluate the toughness of cast metals, it is more important to the user that they overevaluate wrought metals. Since 1880 brittle failures have been occurring when the tensile, elongation and reduction in area have been more than enough to meet any specification.

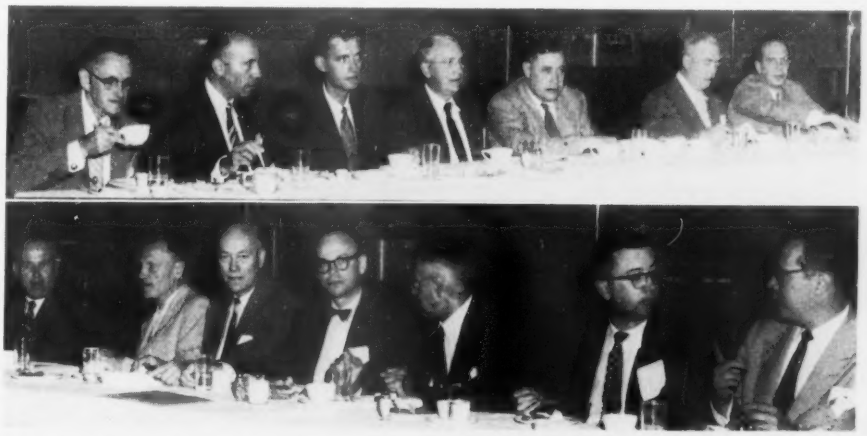
Mr. Caine stated that resistance to brittle failure under stress raisers at low temperature and fatigue strength are the true measures of service "toughness." Castings can compete with forgings from the standpoint of these two properties. It has been shown that the usual casting defects (crack-like defects excepted) do not have a great effect on these two properties.

W. W. Kerlin, Meehanite Metal Corp., New Rochelle, N. Y., discussed "Heat Treatment of Gray Iron Castings to Develop Maximum Properties" in which he pointed out that maximum properties are practical in irons having a good, well distributed, small graphite flake and a fully pearlitic matrix. The main objectives in heat treatment of iron castings include: 1. Annealing for stress relief; 2. Heating and quenching for full hardness; 3. Heating, quenching and drawing to improve strength and toughness; 4. Surface or local hardening with torch or electric induction heating. Annealing to improve machinability often is included, but generally cast iron has free machining qualities providing an outstanding characteristic.

The speaker pointed out that high-strength irons are most frequently subjected to heat treatment for improved properties, so it must be recognized that the matrix pearlitic structure is somewhat comparable to that of a carbon tool steel. Manganese content of the iron, however, may be two or four times that of the simple tool steels, with increased susceptibility to cracking on heating, but especially with high severity of quench. Accordingly, slow heating to 1000 or 1100° F is recommended whether for stress relief or for subsequent high-temperature austenization prior to some form of quench treatment. If the casting is to be hardened, it is transferred from the low-temperature furnace and heated rapidly through the critical range to 1575-1600° F. This temperature is higher than for tool steels, largely because of the effect of silicon on raising the critical and the effect of manganese on slowing down diffusion rates.

After quenching, it is important to draw back immediately to about 400° F to prevent cracking and maintain full hardness and maximum resistance to wear. A fact of extreme importance to heat treaters and to material engineers is that iron castings do not exhibit simple linear relation between hardness and tensile such as is found in carbon and alloy steels. Thus on drawing above 400° F there is a progressive drop in hardness as observed in steels. However, the tensile strength and toughness progressively increase as the temperature of draw is raised to 700-750° F. Thereafter, the strength, toughness and hardness traces follow a similar declining pattern. Local flame and induction hardening of iron castings follows the same general basic principles as for various quench hardening treatments.

In conclusion, Mr. Kerlin stated that it should be evident that with imagination on the part of the casting manufacturer, with the application of sound heat treating principles to develop maximum properties in the castings, the materials



View of the speakers table at the luncheon on the second day of the meeting

HOW IMPORTANT IS RELIABLE

HERE'S HOW USERS OF
NEWAYGO
sand handling systems
FEEL ABOUT IT!

Pacific Steel Casting Company

1333 SECOND STREET
Berkeley 10, California
TELEPHONE LANDSCAPE 5-9200

June 3, 1955

Mr. M. J. Bell, President
Newaygo Engineering Company
Newaygo, Michigan

Dear Mr. Bell:

In December of 1954 your Company installed a sand handling system complete with shakeout, dust collecting and sand reclaiming equipment at this plant. This equipment has been in steady operation five days a week since that time and we have experienced no trouble of any kind with the equipment furnished by you.

The installation has enabled us to maintain uniform sand control. This has resulted not only in improved casting finish but also reduced cleaning room costs. Another factor is the improved working conditions in the plant due to the elimination of dust from our shakeout and sand handling operations.

At about the same time you installed two "Handy Sandy" Units to provide overhead sand for two molding stations. These Units have also operated perfectly and where we formerly required a four man crew we now operate with three men. This reduced crew is able to produce 25% more molds per hour. The result has been a substantial reduction in molding cost.

* We also wish to compliment your Company on the excellent cooperation which we received from the planning stage to the completion of the installation. This is a real service to any company which is considering the installation of a sand handling system.

Very truly yours

J. D. Genger
Vice President,
In Charge of Operations

JDG:gb

"We also wish to compliment your Company on the excellent cooperation which we received from the planning stage to the completion of the installation. This is real service to any company which is considering the installation of a sand handling system."

ESERVICE TO YOUR FOUNDRY?

From planning to installation . . . $50,000 to $600,000 jobs . . . these foundries found Newaygo Service as reliable as Newaygo Equipment for efficient, low-cost sand handling . . .

"I want to thank you for the way you handled our order A-22170. This kind of cooperation is really appreciated.
"Buying parts today is a simple transaction. Getting them in the plant and operating is a different story and the only way this is possible, is by dealing with people like you. Thanks again."

Barnes MANUFACTURING CO MANSFIELD, OHIO

Domestic Water Systems • Self-Priming Centrifugal Pumps • Pressure Pump Heads

July 20, 1955

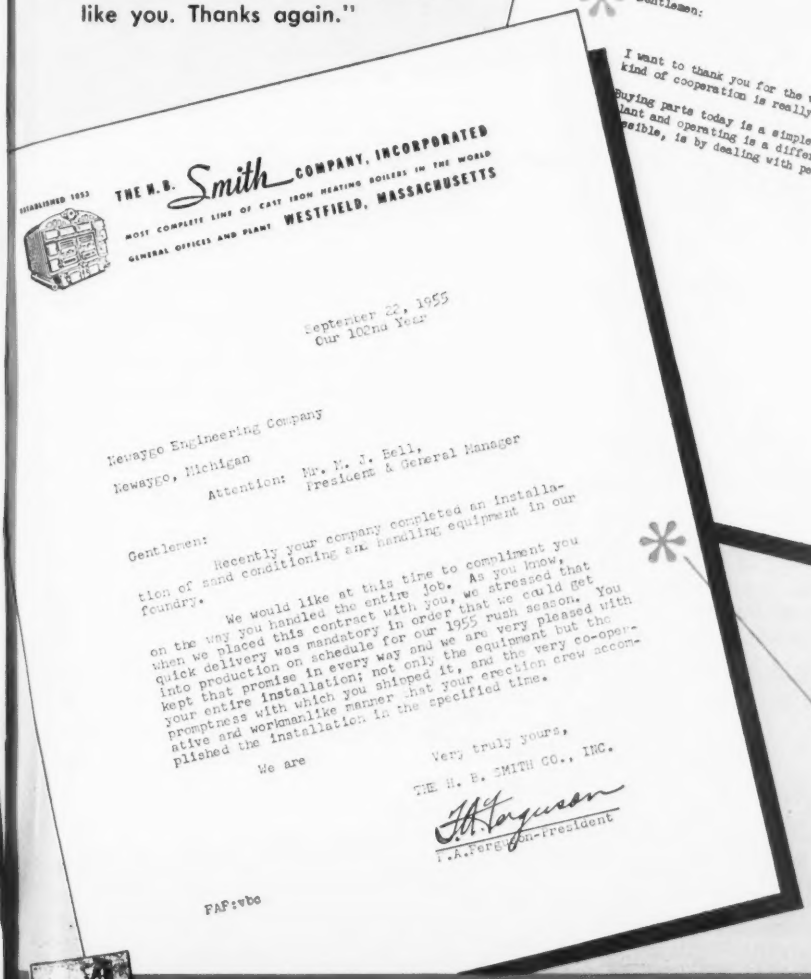
Newaygo Engineering Co.
Newaygo, Michigan
Attention: Mr. Ferguson

Gentlemen:

I want to thank you for the way you handled our order A-22170. This kind of cooperation is really appreciated.

Buying parts today is a simple transaction. Getting them in the plant and operating is a different story and the only way this is possible, is by dealing with people like you. Thanks again.

Yours very truly,
Paul Barbet
BARNES MANUFACTURING CO.
Purchasing Dept.



ESTABLISHED 1853 THE H. B. Smith COMPANY, INCORPORATED
MOST COMPLETE LINE OF CAST IRON HEATING BOILERS IN THE WORLD
GENERAL OFFICES AND PLANT WESTFIELD, MASSACHUSETTS

September 22, 1955
Our 102nd Year

Newaygo Engineering Company
Newaygo, Michigan
Attention: Mr. M. J. Bell,
President & General Manager

Gentlemen:

Recently your company completed an installation of sand conditioning and handling equipment in our foundry.

We would like at this time to compliment you on the way you handled the entire job. As you know, when we placed this contract with you, we stressed that quick delivery was mandatory in order that we could get into production on schedule for our 1955 rush season. You kept that promise in every way and we are very pleased with your entire installation; not only the equipment but the promptness with which you shipped it, and the very co-operative and workmanlike manner that your erection crew accomplished the installation in the specified time.

We are Very truly yours,
THE H. B. SMITH CO., INC.
H. A. Ferguson, Vice-President

PAF:vbc

"... You kept that promise in every way and we are very pleased with your entire installation; not only the equipment but the promptness with which you shipped it, and the very co-operative and workmanlike manner that your erection crew accomplished the installation in the specified time."

A copy of "Planned Mechanization for Foundries" is yours for the asking. Write, wire, or phone today.

NEWAYGO | **engineering company**
NEWAYGO, MICHIGAN

Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment

NOT A CORE *in a carload*

...but **A LOT MORE CASTINGS**

with **DUREZ**

...the preferred shell molding resin

Here is an example where a change-over from sand casting to shell molding paid off in three major cost factors . . . production of the raw castings, shipping weight, and finishing.

By casting these gray iron auto valve port sleeves in shell molds bonded with Durez resin, Wright Casting and Manufacturing Co. eliminated the need for a separate window core. Weight reduction resulting from the new method was more than 50%, lowering freight charges proportionately. A roughing operation was also eliminated and the shell molded iron is easier to machine.

Like other leading foundries, Wright Casting is sold on Durez resins from experiences of this kind. When you get really fast curing, with mold rigidity that ends the need for a window core, it's a hard-to-beat combination.

Durez can help you not only with shop-proved foundry resins, but also with practical suggestions for getting the results you want. Just write anytime.

DUREZ®

PHENOLIC RESINS

MOLDING COMPOUNDS

INDUSTRIAL RESINS

PROTECTIVE COATING RESINS

34 Years of Leadership in Meeting Industry's Needs for Phenolics

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Put me on your mailing list for "Shell Molding News"

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Company .....
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City and State .....

SHELL MOLD RESINS THAT FIT THE JOB

engineer will find at his disposal a cast metal which can prove and sustain its economic advantage among the ever-increasing family of true engineering materials.

In the final paper, Harry C. Ahl Jr., National Bearing Metal Division, American Brake Shoe Co., Meadville, Pa., discussed "Economics of Quality Control in the Bronze Foundry." While small foundries do not have the ability to hire technical people, the speaker said that the best quality control program can be established in a shop without a metallurgist, if top management has the honest desire to improve its practices.

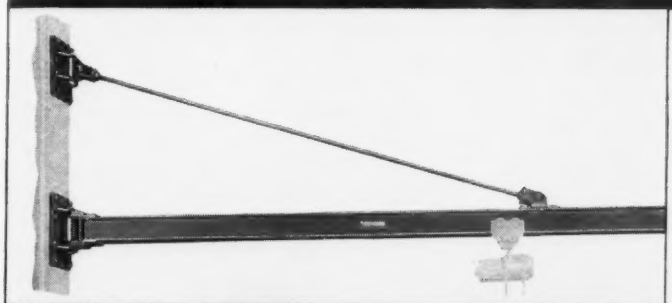
In Mr. Ahl's opinion there is no place in the competitive industry for the management which does not have the desire to improve practices. With raw material prices at their present levels, the man who is not interested in improving shop practice will not stay long on the job. A quality control program in the small shop could include control of the quality of incoming raw materials, control of melting, of sand, of gating and risering, of pouring, shakeout, cleaning and effective casting analysis. None of these requires the expenditure of much money to realize ready operating profit. Mr. Ahl discussed in some detail the methods of handling control of these various factors in operation.

Describes Quality Control Programs

Several types of programs can be used, depending on the extent of the quality control to which the shop aspires. A simple program of no cash outlay but improved supervision probably is the first step in all programs and may be as far as the shop may wish to go. The speaker suggested that a good quality control system should include the consideration of a small cash outlay for some small equipment, such as a small moisture teller, etc. Mr. Ahl told how the mere purchase of a moisture teller and rigidly adhering to customer specifications led to the desirability of equipping an entire sand laboratory.

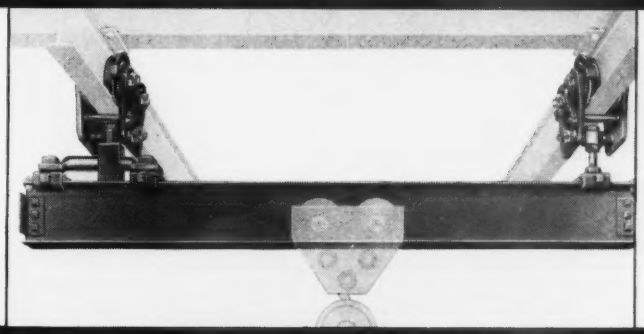
Progress of the Foundry Educational Foundation and the American Foundrymen's Society were discussed at the two luncheons. E. C. Hoenicke, president, and Edward J. Walsh, executive director, reported on the FEF on Thursday. Bruce L. Simpson, president and W. W. Maloney, secretary, discussed future plans of AFS on Friday, the final day of the meeting.

The solution to your foundry problems often hang on ONE of R-W's BIG 3



R-W 939
Swinging Jib Crane

. . . is most commonly used with the rod support (above), but is also available with curved track for supporting outer end of boom. Available in a wide variety of sizes with capacities up to 4000-lbs.



R-W 971
Flexible Traveling Crane

. . . yoke and cross head are self-adjusting to variations in track span . . . crane cannot bind because bridge need not maintain right angles to tracks. Available in many sizes with capacities up to 8000-lbs.

R-W 2035 Zig-Zag
Continuous Power Conveyors

. . . utilize often-wasted ceiling space. Horizontal and vertical ball-bearing wheel units alternate in a continuous chain, moving steadily, safely, smoothly through special protective steel tubing. Easily installed, negotiates 2-ft. radius horizontal and vertical curves. Carries loads on 6-in. centers; unit loads up to 250-lbs. when properly distributed.

. . . quality engineered for precise performance!

Today's featured performers in many modern foundries, are Richards-Wilcox cranes and Zig-Zag conveyors. That's because these material handling systems are scientifically engineered to cut costs, break bottlenecks, speed production—while operating with safety and efficiency at low cost.

Your problem—whether it involves a single unit for a particular handling step, or a complete system for your overall operation—can often be solved *best*, with economical Richards-Wilcox equipment.

Why not lay your foundry material handling problems before a Richards-Wilcox engineer today. He can show you, without cost or obligation, how to effect remarkable savings in time, money and maintenance.

Richards-Wilcox
MANUFACTURING COMPANY
Materials Handling Division

75 YEARS of QUALITY and SERVICE by RICHARDS WILCOX AURORA ILLINOIS

466 W. Third St., Aurora, Ill. • Offices in Principal Cities

Sliding Door Hangers & Track • Fire Doors & Fixtures • Garage Doors & Equipment
Industrial Conveyors & Cranes • School Wardrobes & Partitions.

Industry BRIEFS

GRIFFIN WHEEL CO., Chicago, a subsidiary of American Steel Foundries, will erect a new steel foundry on a 17-acre site in Colton, Calif., at a cost of about $1 million. Construction will begin in about six months.

Killark Electric Co., St. Louis, has purchased the building and some of the equipment of Midwest Foundry and Mfg. Co., Sparta, Ill. Killark plans to form a new corporation, Sparta Mfg. Co., and begin foundry operations with 10 to 20 employees. Approximately 2 acres of land come with the building, and an expansion program is contemplated. Midwest will continue to operate, but the new location has not yet been determined.

Electro Refractories & Abrasives Corp., Buffalo, has purchased a 40 per cent interest in Spar-Mica Corp., Montreal, Canada, for an investment of about $1,390,000. Electro advanced $888,888 of the total toward development of two large deposits of feldspar and mica located on tidewater in the St. Lawrence River and Gulf of St. Lawrence areas.

Koppers Co., Pittsburgh, has purchased all assets of Turner & Haws Co., West Roxbury, Mass., and will operate the newly acquired business through its Koppers Metal Products Division in Baltimore. John Turner, president of Turner & Haws, will act as a consultant for Koppers. Vice president Randle S. Haws will move to Baltimore to become manager of gas filter sales and engineering in the Industrial Gas Cleaning Dept. of Koppers' Metal Products Division.

Alcaloy Inc., Trenton, N. J., has purchased Beta Alloys Co., also of Trenton. All equipment and personnel of Beta Alloys have been transferred to Alcaloy, which manufactures permanent mold castings from a special alloy. Alcaloy is one of a number of companies associated with Dickey Industries, Cleveland.

West Instrument Co., manufacturer of control equipment and accessories, has moved its Chicago factory to a new air-conditioned building at 4363 West Montrose Ave. Original unit of the new structure provides over 12,000 sq ft on one floor, with provisions for expansion.

Morgan Engineering Co., Alliance, O., has established a New York district sales office at 30 Church St., New York. Manager is J. Campbell Dolan, former administrative assistant to William H. Morgan Jr., president of the firm.

Botfield Refractories Co., Philadelphia, has appointed W. P. Keith Co., P. O. Box 936, Whittier, Calif., to handle its complete line of refractories.

Keokuk Steel Casting Co., Keokuk, Iowa, has just finished a half-million-dollar expansion program. This increases its capacity by 80 per cent. Among the new equipment installations are a sand handling system and a 2-ton electric furnace.

Norton Co., Worcester, Mass., has appointed seven members of its sales engineering department to be field engineers in district offices. They include Charles A. Bailey and Robert T. Haigh, Teterboro, N. J.; Joseph A. Kwasniewski, Philadelphia; David L. Lloyd-Rees, Pittsburgh; Roland L. Jandron and John D. Seguin, Chicago; and William E. Oliver, St. Louis.

Craft Casting Corp., c/o Bernard Raphan, 450 Seventh Ave., New York, has been granted a charter of incorporation listing 200 shares of capital stock at no par value. Directors are Leonard E. Rosenthal, Beatrice Birnbaum and Lenore Morris, all of 205 West 34th St., New York.

Climax Molybdenum Co., 500 Fifth Ave., New York 36, has appointed Whitehead Metal Products Co., 303 West Tenth St., New York 14, to distribute its alloys in New England and the Middle Atlantic seaboard areas.

Richard C. Remmey Son Co., Philadelphia, has appointed W. P. Keith Co., 1234 East Sixth St., Whittier, Calif., to be West Coast sales representative for its complete line of mullite, silicon carbide, zircon, alumina and clay refractories.

Magic Chef Inc., St. Louis, has acquired the operating assets, trade names, tools and facilities of Dortch Stove Co., Franklin, Tenn. It will operate as a new corporation, Dortch Stove Co. Inc., but products and personnel will remain unchanged.

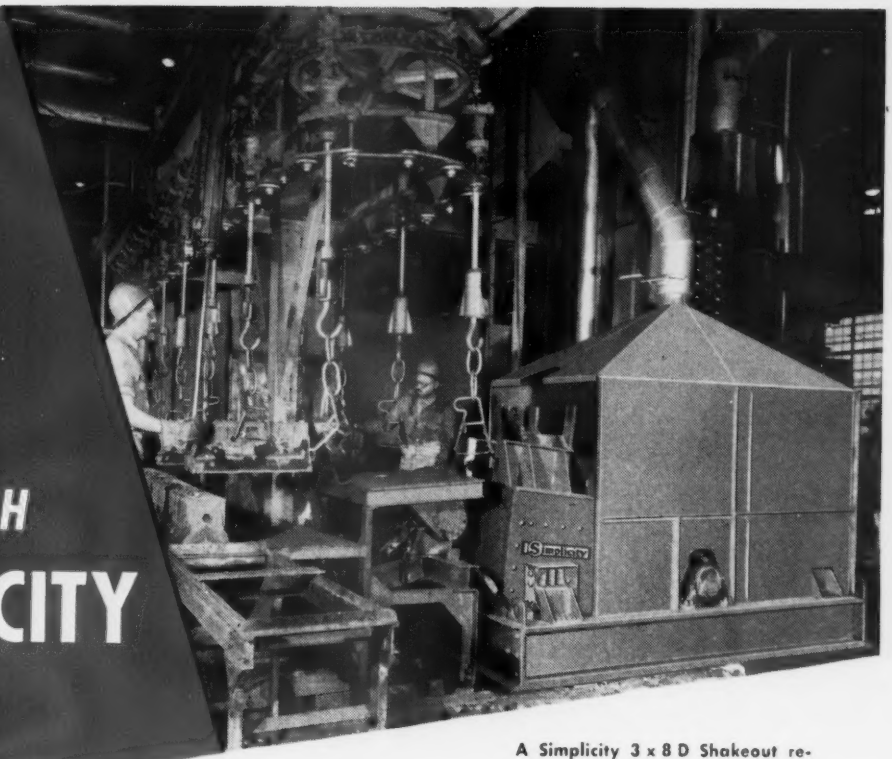
Kulp Foundry Inc., formerly of 64 North Third St., Stroudsburg, Pa., has moved to Stokes Mill Rd., East Stroudsburg.

Oswald Refractories Co. has moved to larger quarters at 1617 South Brentwood Blvd., St. Louis 17.

Detroit Harvester Co., Detroit, has bought Peters-Dalton Co., Detroit, producer of spray booths, washers

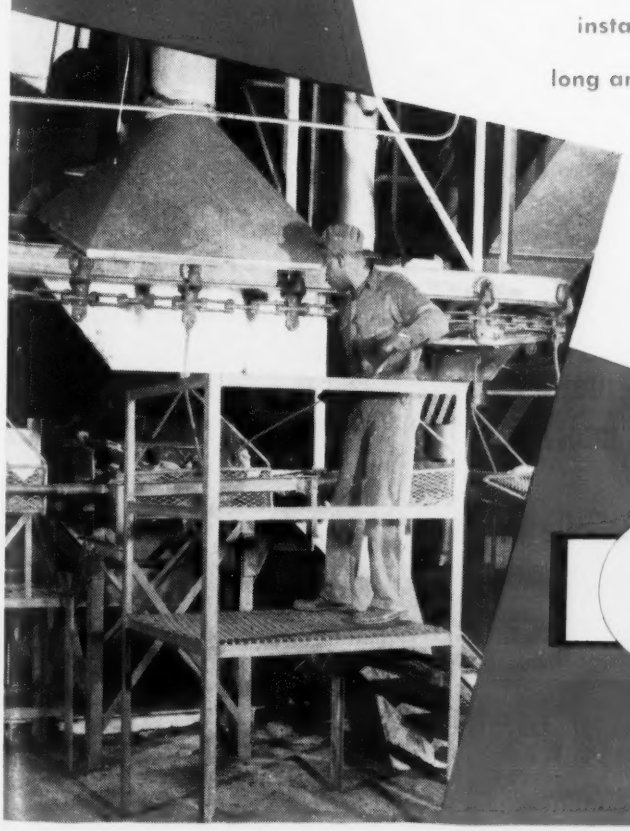
SILICA REFRACTORIES PLANT: Continuing the $35 million expansion program it began in 1951, Harbison-Walker Refractories Co., Pittsburgh, has completed a new plant for the manufacture of silica refractories at Leslie, Md. Both conventional and super-duty brick will be produced at the new facility, which includes all the latest operating techniques as well as the latest improvements in machine design. Harbison-Walker now is operating a total of 29 continuous tunnel kilns in its plants

NEW, BIG AUTOMOTIVE GREY IRON FOUNDRY EQUIPPED WITH 39 SIMPLICITY UNITS



A Simplicity 3 x 8 D Shakeout removing shot at the new foundry.

Simplicity was called upon to supply thirty-nine units for this newest and finest of foundries. Included are 2 Simplicity Screens, 13 Simplicity Feeders, and 24 Simplicity Shakeouts. The history of all our previous foundry installations indicates that these thirty-nine units will have a long and trouble-free operating life. In this new foundry, as in so many other successful foundries, the SIMPLICITY equipment will help produce cleaner castings on faster schedules with reduced manpower.



A Simplicity 3 x 8 D shaking out sand cores.

If you have a problem with shakeouts, sand conditioning units, screens, feeders or similar units, call a Simplicity representative or write for catalog

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND 7, MICHIGAN

SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.
FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario
FOR EXPORT: Brown and Sites, 50 Church St., New York 7, N. Y.

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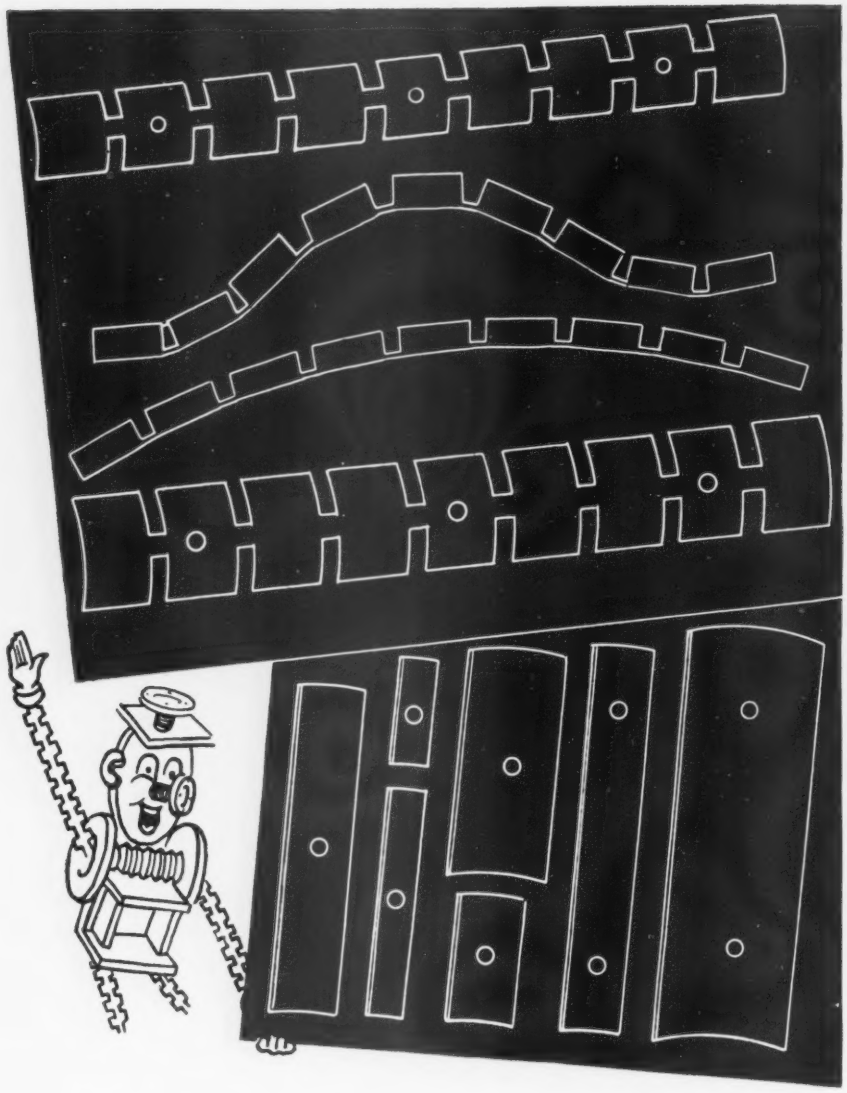

Milwaukee
PATENTED ADJUSTABLE RADIUS CHILLS
STANDARD RADIUS CHILLS
SPECIAL CHILLS
Eliminates Small Surface Cracks in Fillets
Prevents Molten Steel from Cutting into Sand
Easily Bent to Fit Along Curved Edges
Saves Cleaning and Welding Costs
Available in Fixed Radii from 1/4" to 1 1/2"
Milwaukee Chaplet & Mfg. Co.
1025 SOUTH 40th STREET • MILWAUKEE 46, WISCONSIN

and ovens for the metals industries. Peters-Dalton will retain its name and personnel, but will be a wholly-owned subsidiary of Detroit Harvester, which manufactures automotive parts and equipment, power lawn mowers and farm mowers.

Townsend Patterns Inc., has been formed in Milwaukee with a capital stock of 1250 shares of common, no par value. Incorporation papers were signed by Wayne Roper. Howard Kressin, 1821 South First St., is registered agent for the corporation.

Republic Steel Corp., Cleveland, has appointed Thornel Associates, 4754 West Washington Blvd., Chicago, a newly formed organization, to sell and distribute the company's material handling equipment.

Automatic Transportation Co., 149 West 87th St., Chicago 20, has appointed DeShazo & Thomas, 107 Broadway, Birmingham, its representative in Alabama and northern Florida.

Hayes Corp., Grand Rapids, Mich., has changed its name to United Industrial Corp. The company recently acquired Detroit Stoker Co., Monroe, Mich., which brings its subsidiary and affiliated companies to six.

General Foundry Machine Co. has been incorporated in Cleveland with a capital stock of 250 shares of no-par common. Agent is Robert L. Lewis, 1130 B. F. Keith Bldg., Cleveland.

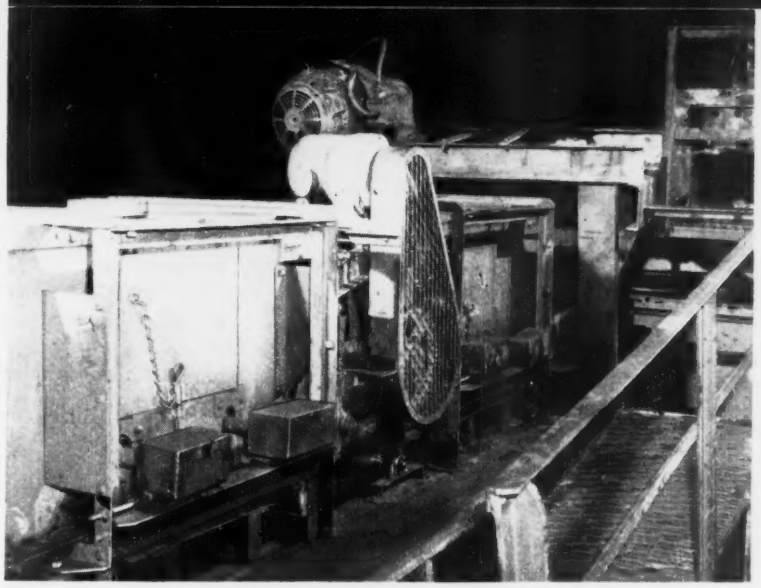
Century Electric Co. has moved its Cleveland district Office to Room 204, Center-West Bldg., 20959 Center Ridge Rd., Cleveland 16. Frank Hatfield is district manager.

Hooker Electrochemical Co., Niagara Falls, N. Y., plans to absorb Niagara Alkali Co., Niagara Falls, subject to approval by stockholders of each company at meetings which will be held on Nov. 29.

Goodrich Source of Photos

Through an oversight, FOUNDRY neglected to give credit for the photographs used to illustrate the article, "Close Control Pays Off in Aluminum Foundry Operations," presented in the October issue. These photographs were furnished through the courtesy of the B. F. Goodrich Chemical Co., Division of B. F. Goodrich Co., Cleveland 15.

1 PEKAY MIXER-MULLER installation conditions 125 TONS per hour of molding sand



THIS SINGLE INSTALLATION (at International Harvester's FARMALL WORKS, Rock Island, Illinois) comprises (top) one 2 cutter-2-Muller unit on a 30" belt, and (bottom) another 2 cutter-1-Muller unit on a 24" belt. Sand feeds from the 30" to the 24" at right angles. Removable side plates make inspection and maintenance simple, fast. Any number or combinations of units can be quickly installed, directly on the existing conveyor system, to handle any desired volume of sand.

Up to 125 tons per hour of well-fluffed, lump-free, free-flowing sand . . that's what you get with a PEKAY Mixer-Muller installation like this one. And it's consistently *better-conditioned sand,* coming through at lower temperatures.

What's more, this PEKAY installation was made directly on the distributing belt; no special feed or discharge belt systems were needed. You can see what that meant in time saving—and money saving. And another big PEKAY advantage is that moisture and bond additions are made *automatically,* with the PEKAY Sand and Water Proportioner which prevents slurry feeding if the sand storage bin is empty.

A long and growing list of well-known foundries, large and small, have found that installing PEKAY Sand Conditioning Equipment is a mighty fine investment—and usually a *smaller* investment than you'd have to make for many less modern machines. PEKAY equipment is designed and built to boost production speeds, to improve sand quality, and to combine sturdiness and simplicity for longer life and for easier, less frequent maintenance—all for a lower first cost and with less time and trouble for installation.

It will pay you to get the full story about PEKAY's better-engineered, higher-efficiency *Mixer-Mullers, Slurry Systems, Airators, Troff-O-Matic Conveyors, M-T-Matic Elevator Buckets.*

MAIL THIS COUPON TODAY FOR COMPLETE DETAILS!

Specialists in Foundry Sand-Handling Engineering & Equipment

PEKAY MACHINE & ENGINEERING CO.

871 N. SANGAMON STREET CHICAGO 22, ILLINOIS

M-T-MATIC Elevator Conveyor Buckets
TROFF-O-MATIC Conveyors

Gentlemen:

Please send me details and price information on the PEKAY Mixer-Muller.

NAME _____ TITLE _____

COMPANY _____

STREET & NO. _____ CITY _____ ZONE _____ STATE _____

The Use and Function of

CHILLS in SAND MOLDS

By W. M. HALLIDAY
Consultant
Southport, England

A FUNDAMENTAL requirement of successful sand-mold founding is the most nearly uniform rate of solidification possible in every portion of a casting. To achieve it, runners, gates and risers must give an even flow of metal through all parts of the mold cavity.

With many types of castings, such balancing is not easy because their section thickness varies. Where heavy sections join much thinner ones, it is best to design the entire feeding system so that the coldest portion of the charge is fed to thick sections. This design induces those portions to cool and shrink at approximately the same rate as thinner sections fed with hotter metal. It creates more efficient running and helps to eliminate internal strains or cracking tendencies caused by unequalized shrinkage.

Even with well-balanced gating and runners, risering may be necessary to feed enough hot metal to the solidifying casting. On the other hand, in practical molding, uniform solidification and equalized shrinkage rarely are achieved satisfactorily by the usual adjustments to runner/gate feed or the adoption of risering.

Several other important factors generally prevent uniform solidification, and some are largely indeterminate prior to casting. All are so closely interrelated that alteration of one increases or decreases the effects of others. Their full effects cannot be assessed until the mold has been prepared and certain trial runs made. Then the feeding system or risers can be checked against the castings produced.

When thick wall sections cannot be induced to solidify at the same rate as thinner sections, even by resort to runners, in-gates or risers, metallic chills generally are used to insure the rapid solidification of the thick sections.

The Principle of Chills — A chill consists of a metallic insert with much higher heat conductivity than that of ordinary molding sand. It is embedded in the mold at a carefully preselected point to induce the rapid transfer of heat to other portions of the charge.

Briefly, its effects are to cause heat to be drawn much more quickly from the metal in the immediate region of the chill—that is, the heavy sections—than from metal solely in contact with the surfaces of the mold. Metal in unchilled, light sections of the casting thus remains liquid for a longer period. This step arrests solidification in those portions and promotes an adequate flow of liquid metal from adjoining sections of the casting.

Other Purposes of Chills — Although the primary purpose of chills is to equalize section solidification, they also can do more. Chills often can provide advantages overlooked by many molders and designers. For instance, chills can be used with castings of a certain type to improve metal structure and mechanical and physical properties.

This point can be explained best by a comparison with die castings.

Alloy castings are produced by the die casting process from an inflexible, permanent, metallic die. The charge is squirted into the closed die under high pressure and with great velocity. The die is maintained relatively cool, much cooler than the solidus temperature of the alloy. The charge is pressed powerfully into close contact with the cool walls of the die; this induces almost instantaneous solidification of the outer layers of the charge, in contact with die surfaces.

This extremely rapid solidification results in a wall structure characteristic of die castings. It is a dense, hard, tough outer skin with a fine-grained, homogeneous internal structure. Skin layers are markedly defined from the much softer, coarse-grained and often less homogeneous inner structure. Irrespective of total cast wall thickness, depth of surface skin layers is relatively small, ranging from 0.015 to 0.025 in., according to injection pressure, die and alloy temperatures, velocity of injection and manner of feeding the die.

Breaking strength, hardness and toughness of such die-cast walls are commensurately increased by the rapidly chilled outer layers. In fact, these physical properties are superior to those of a sand-molded casting in the same alloy.

The greater the proportion such outer skin layers bear to the total wall thickness, the greater the increase in wall strength, etc. This fact is the reason that thin, die-cast walls are preferable. In proportion to their thickness, they are much stronger than a thick section when cast to a similar degree of homogeneity.

When part of the wall of a sand-molded casting is treated by the introduction of a metallic chill, wall structure around the chill insert closely approximates that of a die casting. Mechanical and physical properties of the chilled area also resemble those of a die-cast part. When the user of a sand casting specifies that a certain section has to withstand heavy service duty or is highly stressed, it may be advantageous and economical to chill the section. It is desirable for the user or designer to co-operate closely with the foundry when formulating the design of a casting of this character so that all the possibilities for the use of chills may be explored before casting begins.

Chill Materials — Chill inserts can be employed with almost any kind of sand mold and with any metal, although for obvious, practical reasons the metal used for such parts depends largely upon its ready availability. A ferrous foundry would make chills from cast iron or steel. Nonferrous foundries obviously would find it most economical to employ their own metals for chills.

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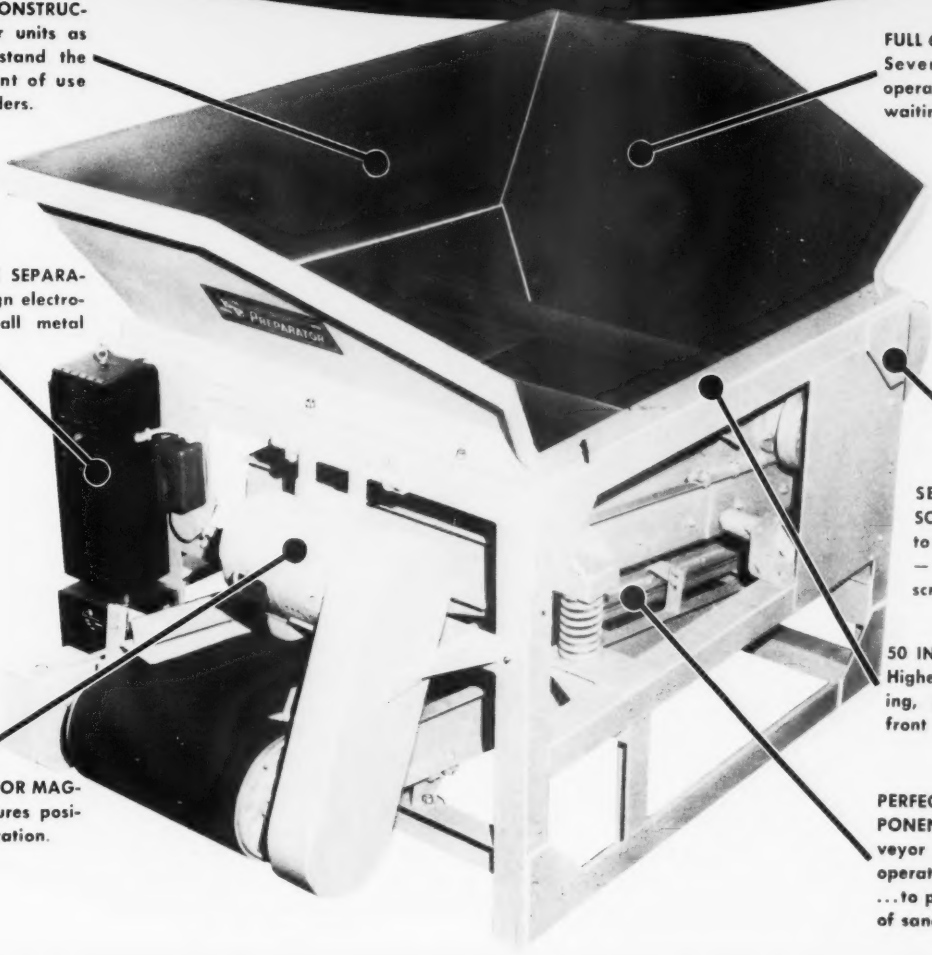

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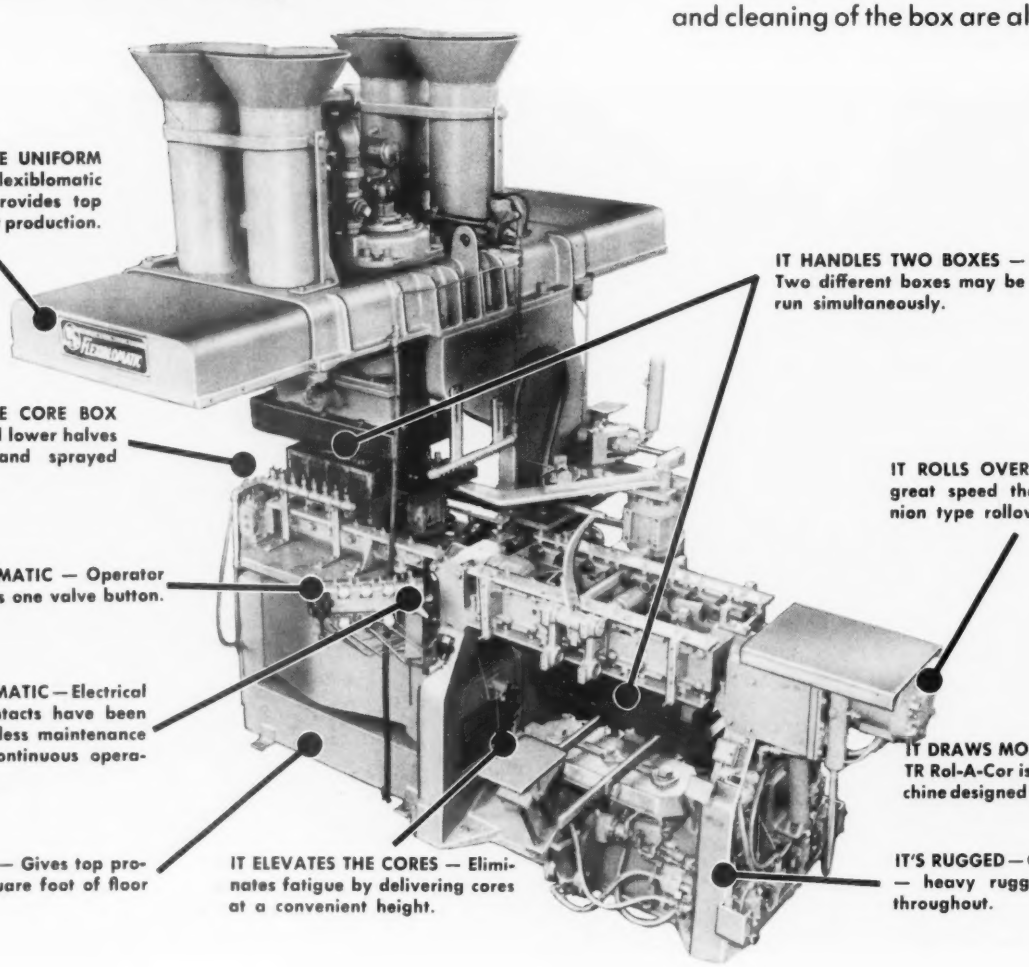

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the most suitable chill is one made in that metal. Gray iron chills also often are best for bronze or aluminum castings because this metal has much less tendency to stick to the finished casting. Moreover, the capacity of gray iron to withstand repeated exposure to elevated temperatures is extremely good; and its heat conductivity value is higher than those of most of the nonferrous metals or alloys commonly used for chills.

In a foundry working solely in aluminum alloys, chill materials may be selected from a wide range of metals or alloys. Gray iron is suitable for such applications, but the much softer brasses or bronzes may be employed satisfactorily. With the use of chills in the latter alloys, however, there is some risk of contaminating the surfaces of finished castings with a reddish scale composed of copper-oxide, which adheres tenaciously and sometimes can be removed only by machining the casting at the affected places. To some extent this condition can be mitigated by dressing the alloy chill surfaces with protective coatings.

Where gray iron or copper alloys are not available for making chills, some doubt exists as to the desirability of employing aluminum alloys of the same grade as the casting material. They can be used successfully providing they can be made from 70 to 100 per cent thicker than a comparable chill in gray iron.

The effectiveness of metallic chills depends largely on the amount of surface area they present for chilling purposes in the mold and on the nature of their surface finish. Generally, the rougher the surface of the chill, the more efficiently it functions. This fact is one of the reasons that old hand files frequently are employed. It is advisable, however, to soften such old files before application to the sand mold, for all chills should be as soft as possible.

When the chill has been used a number of times, exposure to high working temperatures will tend to harden it, thus detracting materially from its effectiveness. To avoid this difficulty many foundries use a chill only once and maintain a substantial new supply of such parts.

Chill Dressings—To obtain the best results from chills, they should be dressed with a protective coating or wash to prevent contamination of the surfaces of the finished casting.

During recent years a few proprietary chill dressings of a special character have been developed and

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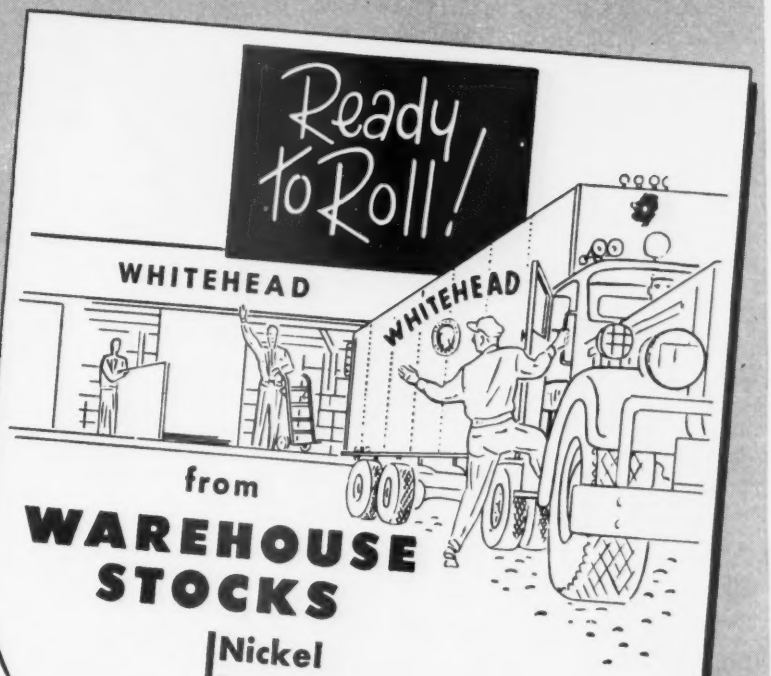

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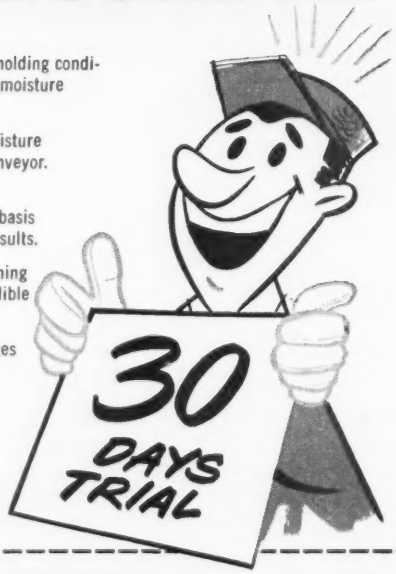

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used in many foundries. These are available in different grades to suit a variety of metals or alloys used for making chills. A good protective dressing can be prepared, however, with a quantity of ordinary red iron oxide suspended in clean methylated alcohol, white alcohol or some similar, inflammable liquid.

The mixture should have a smooth, free consistency to permit easy brushing or spraying onto the surfaces of the chill. The coating is applied evenly and then fired with a blow-torch. This action burns off surplus alcohol and at the same time warms the body of the chill sufficiently to prevent condensation of moisture on treated surfaces. The remaining film of dressing material should then have set hard and will give good protection against the formation of oxide scale when in contact with the molten metal in the mold.

It also is important to heat up the chill immediately prior to its insertion into the mold and before the mold is closed. This step will prevent condensation from developing during pouring.

Venting—As with ordinary, baked sand cores, metallic chills of practically every kind and shape require air-venting. It usually can be provided by drilling a series of small holes diametrically through the body of the chill, at regular intervals along its critical length. All such cross holes should run into a somewhat larger hole drilled axially up the center of the chill. The latter should be left blind at the end where the chill is exposed in the mold.

This form of venting permits the air immediately around the chill to flow in through the holes and upward out of the chill. The size of such holes is, of course, determined largely by the size of the chill, but in practice it rarely is necessary to use cross-located holes more than 3/16-in. in diam and an axial hole in the center more than ⅜-in. in diam.

With relatively small chills, or those with a thin cross section, such drilling may be impractical. Sufficient venting usually may be obtained, however, from the roughened surfaces of the chill itself, or from a few shallow, narrow grooves filed by hand along the sides of the chill. Vents of the latter kind must be disposed along the sides of the chill body coincident with the normal direction in which the charge flows.

It also is worthy of note, in passing, that in very large, intricately

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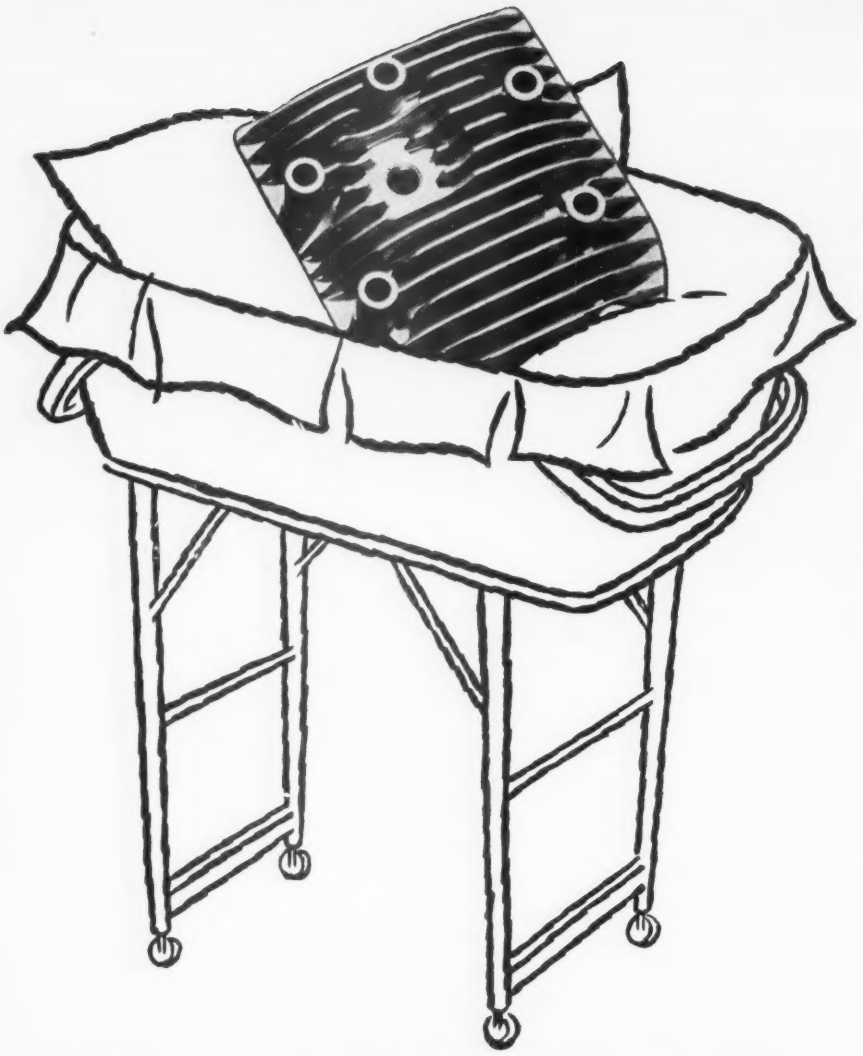

This casting took a lot of pre-natal care

The success of a casting is often determined long before the metal is melted and the casting poured, because no matter how carefully casting is done nor how excellent the mold, a quality part cannot result unless quality metal is used.

Foundries and die-casters need ingots that will be alike in quality and characteristics from lot to lot, especially when castings of intricate character must be precisely cast in quantities. To assure such results, the Federated Metals Division of American Smelting and Refining Company employs the most modern quality control methods. Electronic testing devices and expert metallurgists check each heat poured from Federated's furnaces.

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shaped castings which require chilling over extensive portions, gray iron chills should be used. These parts should be cast from properly prepared patterns to insure chills shaped to conform closely to the shapes of the regions to be chilled in the casting. When such chill patterns are made, the question of air-vents always should be considered carefully and suitably disposed vent channels cast in.

Shape of Chill—Obviously, shape of a chill depends almost entirely upon the configuration of the part of the casting to be treated, the amount of surface area involved and the manner in which the chill can be introduced into the mold.

Chills with circular, square or rectangular cross-sectional shape are preferable and, in fact, are in most common use because of the ease with which such simple shapes can be reproduced by machining or casting. They also generally can be mounted into the mold much more easily and quickly than an irregular shape. Sides of the chill should be given an ample degree of ejection taper to simplify their removal from the casting.

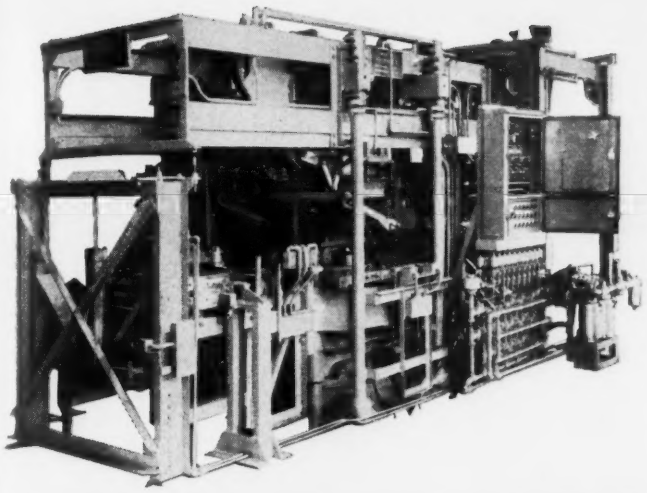
Before a chill is used a second time, it should be well cleaned and given a fresh coating of protective dressing if the original one has been damaged.

Book Review

Handbook of Engineering Materials, edited by John Seastone and Douglas F. Miner, 1382 pages, published by John Wiley & Sons Inc., New York. Price $17.50.

Written by a group of over 50 specialists, each an expert in a particular field of materials, this handbook was developed in the belief that a specialized handbook could not serve engineers efficiently. Engineers in one field increasingly work with materials from another, and this volume is designed for use in such situations.

Information is arranged to facilitate comparisons of materials. The handbook is divided into four main sections: 1. General information on specifications and standards, statistics in the application of materials, mathematics and physical tables. 2. Metals, including both pure metals and special-purpose alloys. 3. Nonmetals, including wood and wood-base materials, paper, fibers, plastics, rubbers, organic finishing materials, fuels, carbon products, ceramic materials, industrial chemicals and lubricants. 4. Materials which are used in construction.



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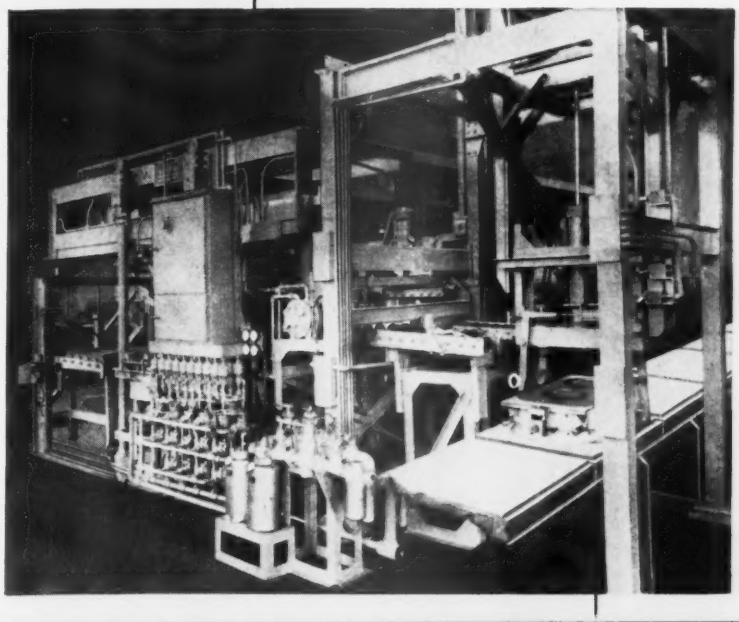

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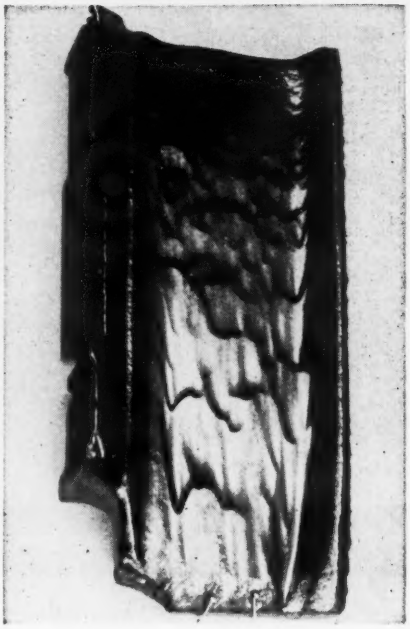
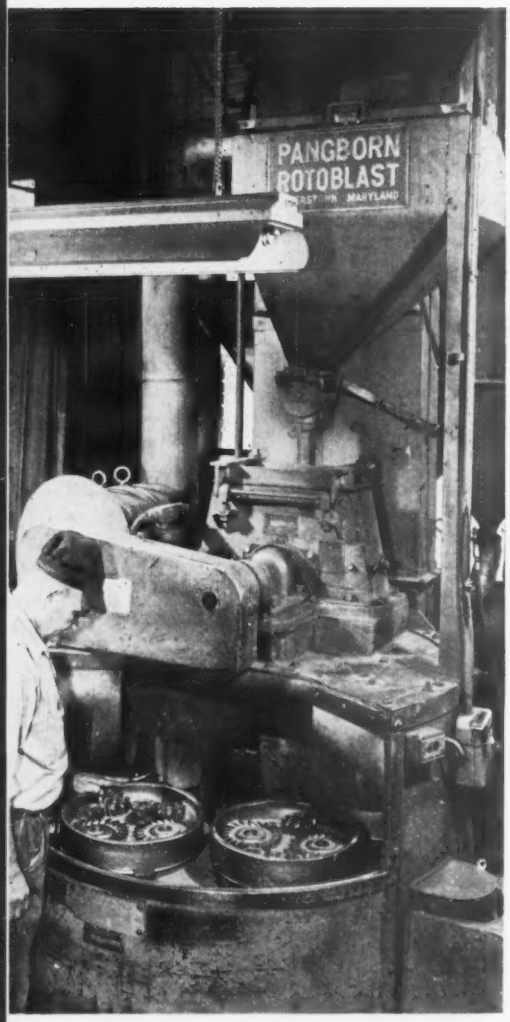


Replace worn or broken vanes, even when not excessively worn



All parts of the table, both interior and exterior, which are subjected to the blasting should be checked frequently

How To Take Proper Care of

CENTRIFUGAL BLAST TABLES

By L. M. JOHNS
Service Manager
Pangborn Corp.
Hagerstown, Md.

CENTRIFUGAL blasting tables generally are used with either a completely flat area on which the work is placed for blasting or with a number of auxiliary tables on top of the main table. With the latter, work is placed on the small, auxiliary tables and rotated through the centrifugal blast stream.

These tables are versatile equipment. Their usefulness covers a wide range of cleaning, from fragile parts (for which no other general type of equipment is suitable) to the diversified work of a jobbing foundry where approximately 70 per cent of the work produced can be cleaned satisfactorily and economically on centrifugal blast cleaning tables.

As in all blast cleaning equipment, parts exposed to blast action wear more rapidly than protected parts. Consequently, daily inspection is necessary. Properly and regularly maintained, however, modern centrifugal blast tables give long life with economical maintenance cost per ton of work cleaned.

Adjust Blasting Stream—Centrifugal abrasive throwing wheels either are mounted flat on top of the table housing or at such an angle that the abrasive strikes both the flat and the vertical surfaces of the work and cleans them all evenly.

It is of utmost importance to adjust the blasting stream so that it covers the effective blasting area of the work without going off the table into surrounding table parts. With a properly adjusted stream, maximum cleaning efficiency is obtained, and wear on table parts is minimized. Correct direction of the

BLAST MACHINE MAINTENANCE CHECK LIST

Month of _____ 195__

Machine Type _____ Serial No. _____

UNIT	INSPECTION DATE	INSPECTION BY	DATE INSPECTED O.K.	DATE AND RESULT CHANGED	DOWN TIME (REASON)	INITIAL
WHEELS Serial No. _____ " " _____ " " _____ " " _____ " " _____						
SEPARATOR						
ELEVATOR						
BEARINGS						
LUBRICATION						
OTHER						

A check list similar to this one assures proper maintenance

For maximum efficiency, blast table operators should receive thorough instructions. All operators should know proper maintenance procedures

blasting stream can be checked easily by placing a target, usually plywood or smooth sheet steel, on the table. Place the target under the blast area and check the pattern produced on the target. Do not rotate the table during this test. If the pattern design runs off the table, the direction of the stream must be corrected.

Keep Table Covered—Another important point is that the blast table surface at all times should be covered completely with work to be cleaned. This precaution not only insures maximum blasting production, but also keeps the blast stream from hitting the table top directly and causing unnecessary wear.

Keep Abrasive Clean—A third item to be kept in mind is that the abrasive should be kept as free from contamination as possible. It is well known that sand and sand dust wears the abrasive throwing wheel a great deal more rapidly than clean abrasive. Clean abrasive not only insures maximum efficiency of the blast, but also reduces wear to a minimum on table parts struck by the abrasive. To insure clean abrasive at all times, the manufacturer's recommendations as to the amount of suction on the abrasive separator and the adjustment of the separator should be followed carefully.

Check Wheels Every Shift—Abrasive throwing wheels should be checked at the end of each shift and worn parts replaced. It is false economy to use vanes and other parts controlling the abrasive stream when they show severe wear. This practice affects the blasting efficiency and causes undue wear on surrounding parts because the abrasive stream changes its predetermined pattern when worn parts are used. It is recommended that the abrasive throwing wheel be checked carefully at the end of each 8-hr shift to replace parts which will not give efficient service for another 8-hr shift.

All parts which contact abrasive in the throwing wheel naturally are subjected to wear. These parts are made, however, of wear-resistant materials designed to give long life. Sometimes, the very fact that these parts do give long life causes operators and maintenance men to become so careless that parts are not replaced as soon as they should be. When they are not, efficiency is reduced and additional wear and higher maintenance cost follow. A great deal of importance must be placed therefore, on daily inspection of the abrasive throwing wheels and replacement of worn parts at regular intervals.

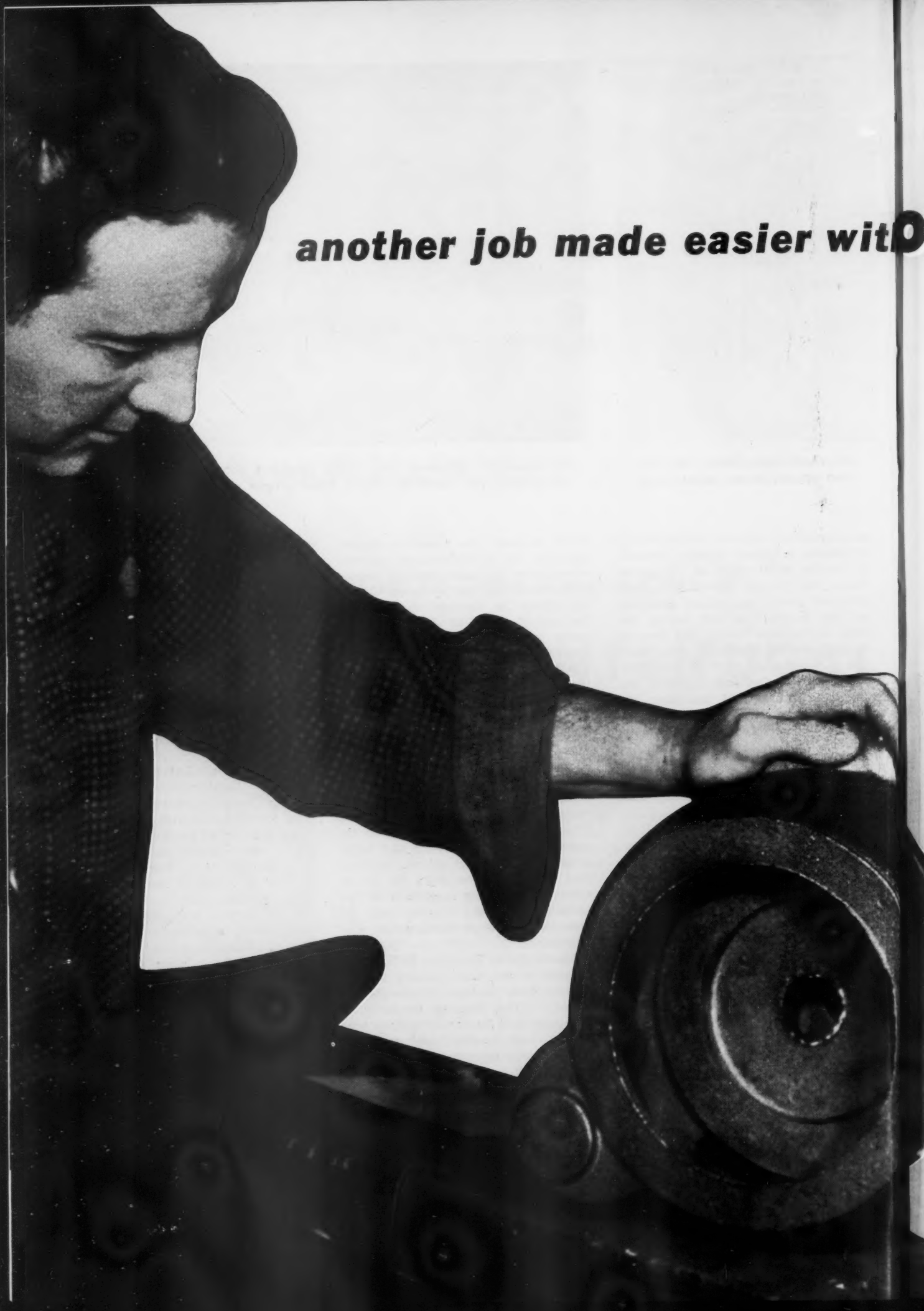
Check Table Housings Daily—The interior of the table housing is subject to wear because of ricocheting abrasive. The housing normally is well-protected by wear-resistant materials and special wear-resistant plates, but the points of greatest wear must be checked daily to insure that any parts which become so worn as to endanger underlying parts are replaced promptly.

Weekly Table Top Inspection — The tops of the work tables are protected by perforated rubber mats on the main portion of the table, and the rims are protected by an auxiliary, replaceable rim. These mats and rims should be checked weekly and replaced when worn to prevent damage to the metal frame of the table proper.

Elevator Maintenance—The elevator which returns spent abrasive for reuse should be checked weekly to make sure the belt is tracking properly and without slippage. Buckets should be fixed securely to the belt and not worn excessively—especially the leading edges. A worn or loose bucket will not carry the abrasive supply away from the elevator boot satisfactorily.

Do Not Over-Lubricate—Lubrication of these machines should be checked weekly. Centrifugal blast tables are designed with the least possible number of moving parts to reduce wear points to a minimum. All bearings must, however, be lubricated at intervals recommended in the manufacturer's instruction manual to obtain maximum efficiency and lowest maintenance cost. Care should be exercised not to over-lubricate centrifugal blast wheel bearings. After the original lubrication, these bearings should not require more than about one shot once every two weeks with the machine running on one 8-hr shift.

Train Personnel—Be sure that operators of the tables receive instructions on the proper use of the equipment. They should know what to look for in parts which have an inherently high mortality. A knowledge of the proper adjustment of the blasting stream should be part of the operators' training. They should know when the abrasive carries an excessive amount of sand and other debris so that the condition can be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Foundries using Osborn Rota-Lifts for producing molds from large match plate patterns find that simplicity of operation and constant uniformity greatly increase production efficiency.

Rota-Lift jolts, rolls over, squeezes, draws and closes the mold . . . all mechanically. Large match plate work is quickly and efficiently handled.

Rota-Lift models are made in different sizes to fit a wide range of foundry molding jobs. Your Osborn foundry specialist will gladly recommend the right Rota-Lift to improve and increase your mold production. Write *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

One man, one machine . . . Rota-Lift produces up to 25 molds per hour, 5 cores to a mold at The Deming Company, Salem, Ohio, manufacturers of pumping equipment.

Leader in automation for the foundry

OSBORN

CORE BLOWERS MOLDING MACHINES
INDUSTRIAL BRUSHES

corrected when circumstances require.

The plant maintenance crew should, of course, be familiar with every detail of the blasting tables and be prepared to make rapid repairs and adjustments if needed. Instruction manuals, drawings, inspection records and other pertinent data should be available to the maintenance crew.

Develop Maintenance Check List—Many users have developed a blast table maintenance check-sheet which lists parts to be inspected, frequency of inspection, personal responsibility, inspection dates, names of inspectors, dates when parts are replaced and lubrication data. With a continuous record of this type, management has the facts for a precise evaluation of the effectiveness of a piece of equipment and the efficiency of maintenance.

Spare Parts Availability—An adequate stock of wear parts should be kept on hand. When inspection indicates that a part is worn so that it no longer operates efficiently, a spare part should, of course, be available for immediate replacement. Manufacturers' recommendations and operating experience will guide the user concerning the stock of spare parts which should be available.

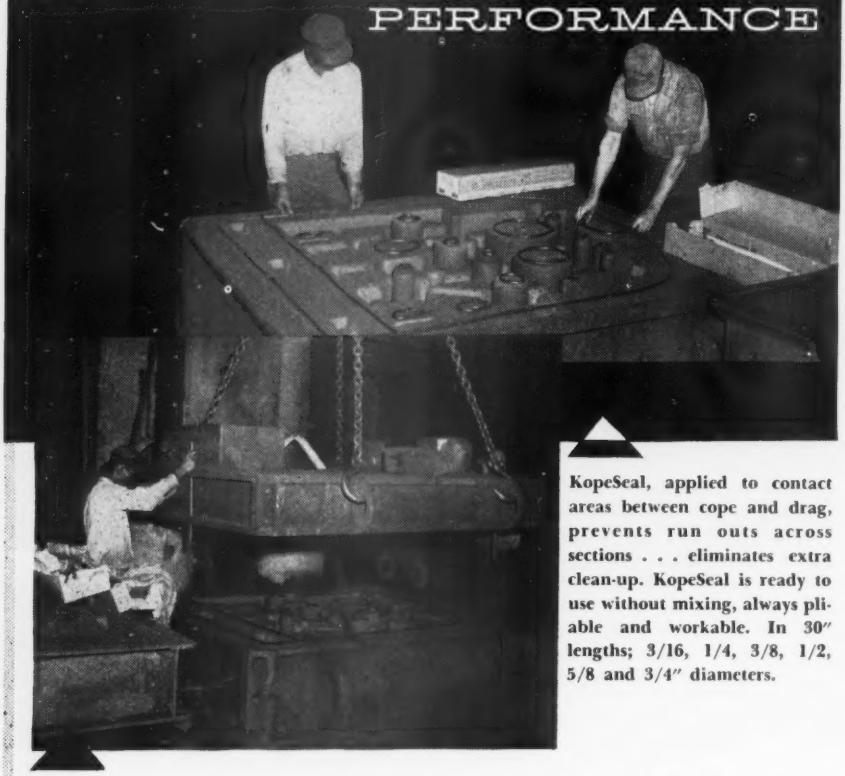
Maintenance Check List—In order to place responsibility and to insure regular maintenance, it is well to have the maintenance department use a checklist similar to the accompanying example. This list could be altered to suit local conditions.

Assign a competent and responsible man to look after maintenance, then have either this individual or others doing work under his supervision keep a checklist — either monthly or weekly—and submit it to plant management. This plan will keep everyone fully informed and help to prevent any tendency toward laxity, thereby insuring maximum productivity at minimum maintenance cost.

Small Firms Can Finance Purchase of Laboratories

Small or medium-sized companies can arrange within as little as 24 hours to finance the cost of a complete industrial laboratory for research, cost control or product development through a plan set up by Chicago Apparatus Co., Chicago, a laboratory supply house. Up to 75 per cent of the cost of equipment, apparatus and supplies can be financed over a 3-year period, with up to 10 per cent of the total purchase in expendable supplies. Inquiries should go to Chicago Apparatus Co., 1735 North Ashland Ave., Chicago 22.

PICTURE PROOF OF KOPESEAL (COPE AND DRAG SEALER) PERFORMANCE



KopeSeal, applied to contact areas between cope and drag, prevents run outs across sections . . . eliminates extra clean-up. KopeSeal is ready to use without mixing, always pliable and workable. In 30" lengths; 3/16, 1/4, 3/8, 1/2, 5/8 and 3/4" diameters.

The cope is positioned on the drag, then removed for inspection of seal. Uniformly compressed bead indicates correct seal; unflattened areas show improper seating, allowing for correction before pouring.

DOES A BETTER JOB THAN MUD OR DOUGH ROLLS ...in *less* time ...at *less* cost!

- QUICK, EASY APPLICATION.
- MORE POSITIVE SEATING.
- PERMITS ACCURATE MEASUREMENT OF METAL THICKNESS.
- SELF-DISSIPATING . . . NO RESIDUE.

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Los Angeles, Calif. — The Hubbard Company
St. Louis, Mo. — M. A. Bell Company
Seattle, Wash. — H. D. Fowler Co., Inc.
Toronto, Ont. — Railway & Power Engineering Corp., Ltd.

KOPESEAL IS ALSO DISTRIBUTED UNDER BRAND NAME
KOPETITE:
Toronto, Ont. — *Canadian Hanson & Van Winkle Co., Ltd.*
KOPEBEAD:
Philadelphia, Pa. — *George F. Pettinos, Inc.*
KOPEROPE:
Harrison, N. J. — *Springfield Facing, Inc.*
Milwaukee, Wisc. — *Milwaukee Chaplet & Supply Corp.*

PRESSTITE SEALING COMPOUNDS
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3766 Chouteau Ave. • St. Louis 10, Mo.

TAYLOR & CO., INC., REPORTS

"90% less machining

through shell molding

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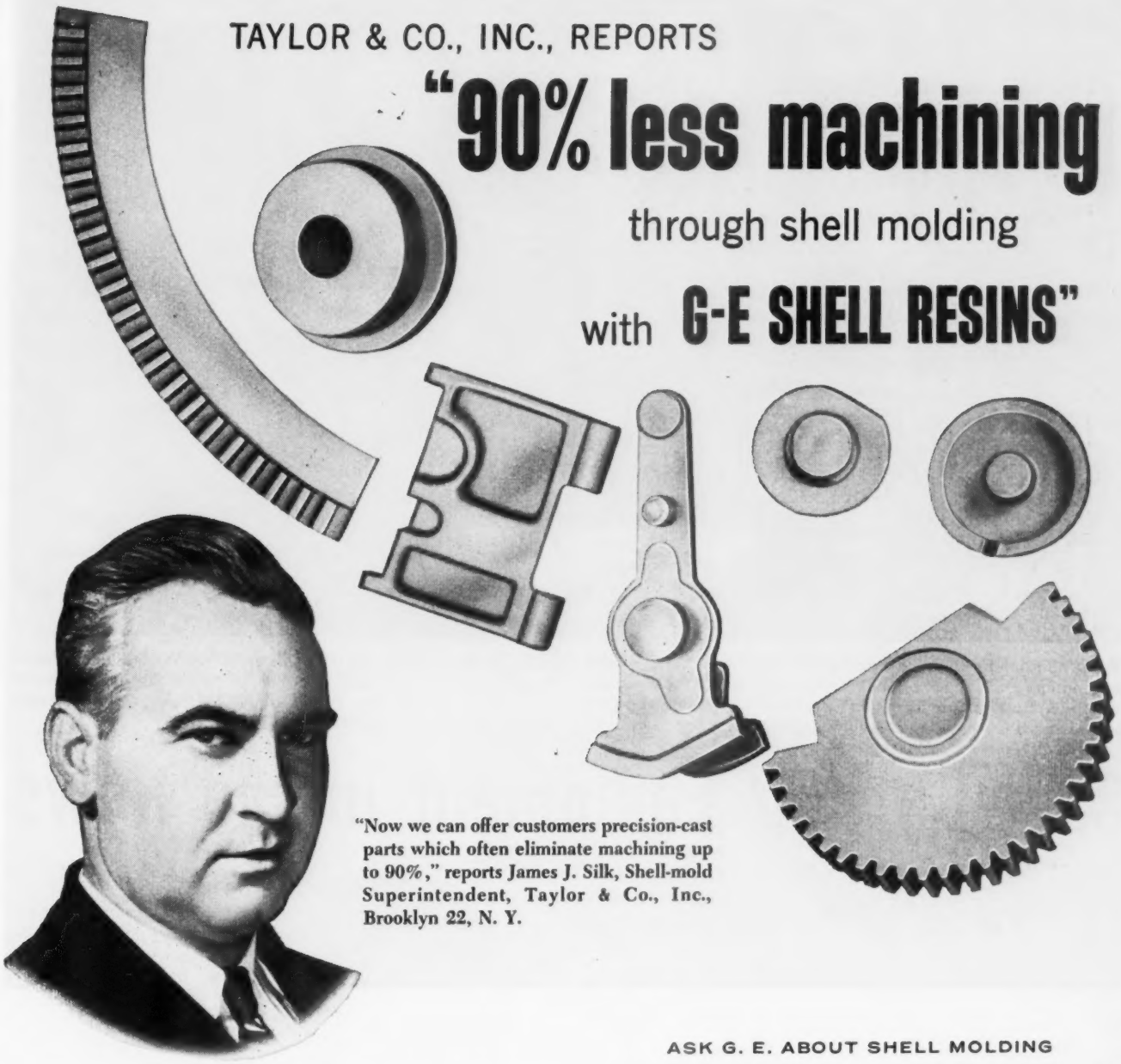

"Now we can offer customers precision-cast parts which often eliminate machining up to 90%," reports James J. Silk, Shell-mold Superintendent, Taylor & Co., Inc., Brooklyn 22, N. Y.

"Shell molding with General Electric resins enables us to turn out intricate castings with a smoothness of finish and sharpness of contour difficult to achieve by conventional sand molding—parts that may often be used 'as-cast.' G-E resins are used exclusively in our shell-molding foundry because their consistently uniform properties help us realize the many advantages of this new casting process."

Taylor uses three General Electric shell-molding products to turn out such cost-cutting parts as shown here: *G-E 12374 phenolic shell-molding resin* to form strong, dimensionally accurate molds, *G-E SM-55 silicone parting agent* to secure quick, easy release of molds from patterns, and *G-E 12316 bonding resin* to cement shell halves together.

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ASK G. E. ABOUT SHELL MOLDING

How can shell molding help YOU? General Electric maintains a shell-molding laboratory in Pittsfield, Mass., to help foundrymen and casting buyers solve problems and evaluate the process. G.E. also offers an informative 28-page manual describing the techniques and benefits of this new foundry method. *Send for it today!*

FREE BOOKLET AVAILABLE!

General Electric Company
Section 1522-5A, Chemical & Metallurgical Div.
Pittsfield, Massachusetts

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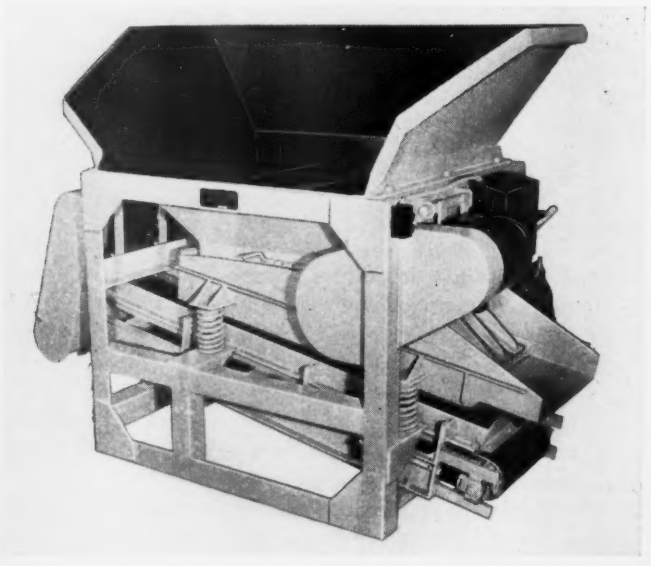
(Advertisement)

FOUR MEN handle all of the molding operations for eight cope and drag stations on this above-floor B&P Rotomold unit at the American Foundry & Machine Co., Salt Lake City, Utah. Cope and drag patterns for each job are mounted on a single pattern board at eight roller conveyor stations on the Rotomold table. The Stationary Sandslinger rams any number of different jobs. *Write for full information to Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.*

Cost-Cutting Equipment in the News

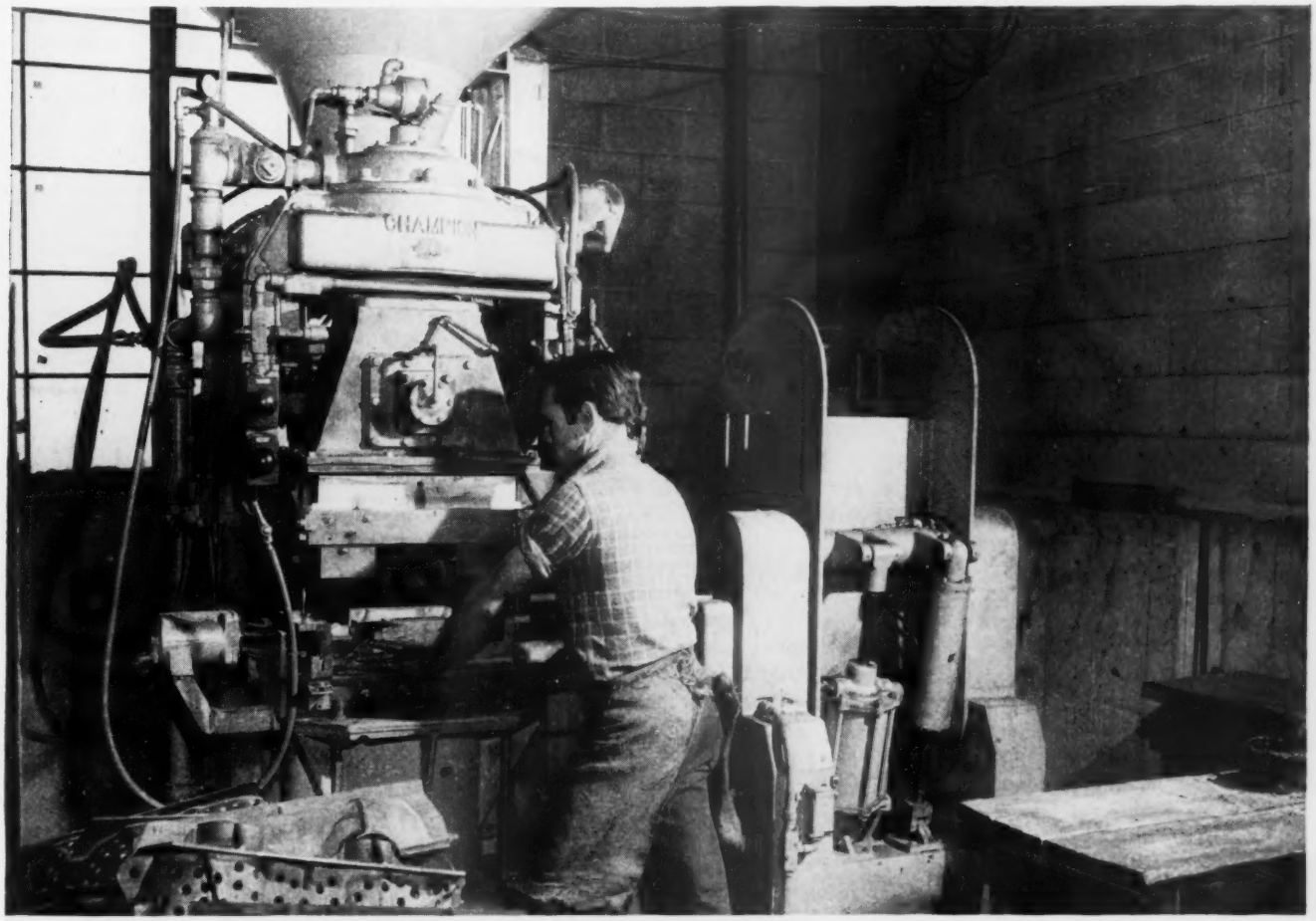


THE NEW ABOVE-FLOOR Model "60" Preparator, introduced by Beardsley & Piper, has greatly simplified the installation of Speedmullor-Preparator units. The installation costs of these complete sand conditioning and mulling units is now lower than ever. *Write to Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois for full information and prices.*

SMALL SIDE FLOOR WORK is handled efficiently at the Empire Pattern & Foundry Co., Tulsa, Oklahoma on two inexpensive J&J Portable Jolt-Squeezers. Rammed molds are set out on the floor for pouring. *Full information on J&J machines may be obtained by writing to Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.*

AUTOMATIC CONTROL of sand preparation has been further simplified and refined by a new Skiptrol device. Skiptrol, introduced by Beardsley & Piper, accurately controls loading of the Speedmullor skiphoist bucket. The diaphragm pressure switch located in the skiphoist bucket is shown here. Skiptrol is one of a complete line of automatic controls manufactured by B&P. These include Mulltrol, Mulltrolmatic, Blomatic, and Cormatic. *New detailed information on Skiptrol is obtainable from Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.*

ALL OF THE CORES required for operations at the Belnap Manufacturing Co., Bridgeport, Connecticut are made from core sand thoroughly mulled in this Model 3½ Mulbaro. Belnap, manufacturers of an outstanding line of valves, depends on this Mulbaro, Speedmullors and a Swingslinger in their very efficient foundry. *For more information write to Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.*



OVER 1400 forty pound double transmission cores are produced each day on this Champion Cormatic Unit at the Newnam Foundry, Kendallville, Indiana. The core sand for this exacting job is mulled in a Speedmullor. Cores blown on the Champion Blomatic Core Blower at left, are rolled over and drawn on the Rol-A-Cor Unit at right. *Champion Cormatic units are described in a new bulletin available from Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.*

Osbrink Mfg. Co. foundrymen examine the aluminum moonface shown here before removal from the mold

Molder slicks parting line around plaster moonface preparatory to making the aluminum sand casting

Disneyland Clock Has

CAST ALUMINUM MOONFACE

BEHIND the fun and fantasy of Disneyland lies the story of sound engineering and industrial techniques, for while Walt Disney's "magic kingdom" near Anaheim, Calif., was conceived by artists, it required the ingenuity of engineers and fabricators to make it a reality.

Expert aluminum sand casting, for example, proved the solution to fabricating the decorative moonface atop the 20-ft-high clock at the entrance to Tomorrowland.

As envisioned by Disneyland artists, the moonface and a fanciful sun would revolve above the conical clock, symbolizing night and day.

The moonface, measuring 40 in. between points and 4 in. thick at its thickest point, had to be strong, permanent and corrosion-resistant. It also had to be solid, at least in appearance, to give feeling of body to balance the bulky sun, yet light to keep down weight of the decorative unit.

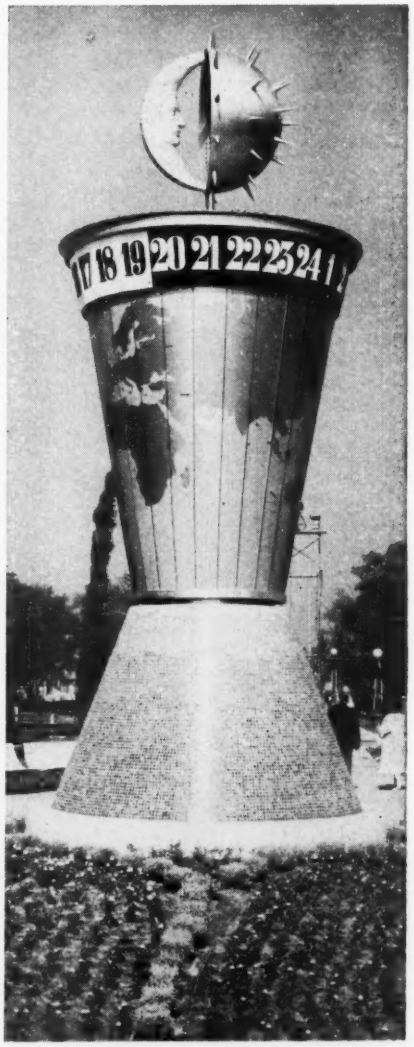
Disneyland designers, working closely with Kaiser Aluminum & Chemical Corp. engineers, decided an aluminum casting would meet all the requirements.

R. H. Osbrink Mfg. Co., Los Angeles, was chosen to do the job.

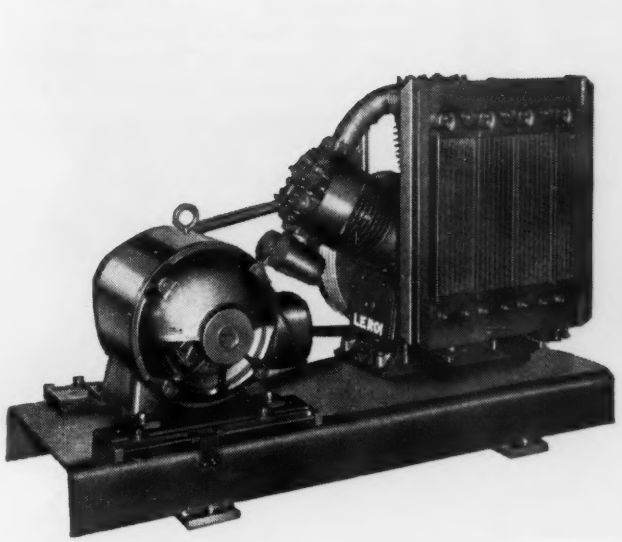
First, a clay moonface was sculptured by Disneyland craftsmen. A plaster replica was then made and turned over to Osbrink. Osbrink sand cast the moonface, using exacting molding techniques to produce the fine ornamental detail. The details were hand polished to produce brilliant highlights, and the casting was then anodized.

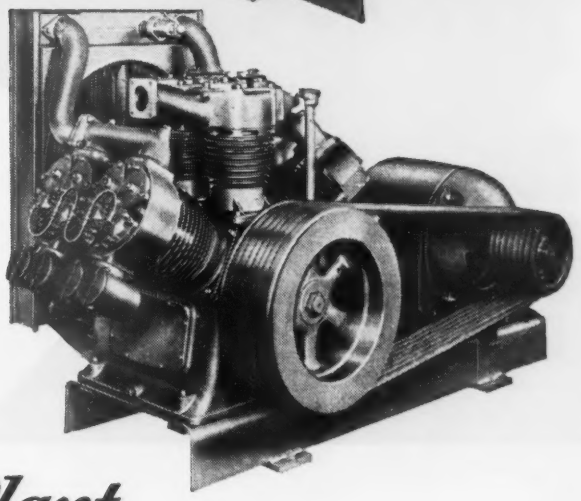
The moonface is bolted at its points to the sun, which is of spun aluminum. The two are held aloft by a central rod, which is attached to the clock mechanism. The conical clock has an aluminum skin in its natural gray color, to which are laminated continents cut from gold anodized sheet. A revolving band of plastic numbers indicates time in all sections of the world. The clock mechanism was furnished by U. S. Time Corp., which is sponsoring the big Tomorrowland entrance marker as its participation in the park.

Tomorrowland, where Kaiser Aluminum and several other national industrial firms have exhibits, presented an unusual opportunity for imaginative use of materials, since all Tomorrowland equipment had to be



View of clock shows the aluminum moonface installed. The plastic numbers indicate time in all sections of the world





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Take full advantage of every space in your plant where the economies of airpower can increase production and lower costs. How? By using Le Roi's two-stage, air-cooled stationary compressors that require a minimum of space, and are easy to install.

They're compact and lightweight. Moreover, these Le Roi compressors require no cooling water, eliminating the need for expensive space-eating pipes. There's no danger of freeze-ups or overheating from lack of liquid coolants. Only minimum attention by an operator is needed.

The new three cylinder 50S2, and six cylinder 75S2 and 100S2 compressors are balance-designed, reducing vibration and noise to a minimum. Available in 50, 75, and 100-hp sizes producing 210, 340, and 450-cfm capacities at 125 lbs. pressure, these new Le Roi airpower units offer low-cost operation, low-cost installation, and low-cost maintenance advantages for a wide range of needs.

For years Westinghouse compressors were the national favorite in the ½ to 40-hp size range. With the three new Le Roi sizes, an even greater range of dependable airpower is yours — up to 100 hp.

Write today for complete literature describing Le Roi's dependable, low-cost air supply.

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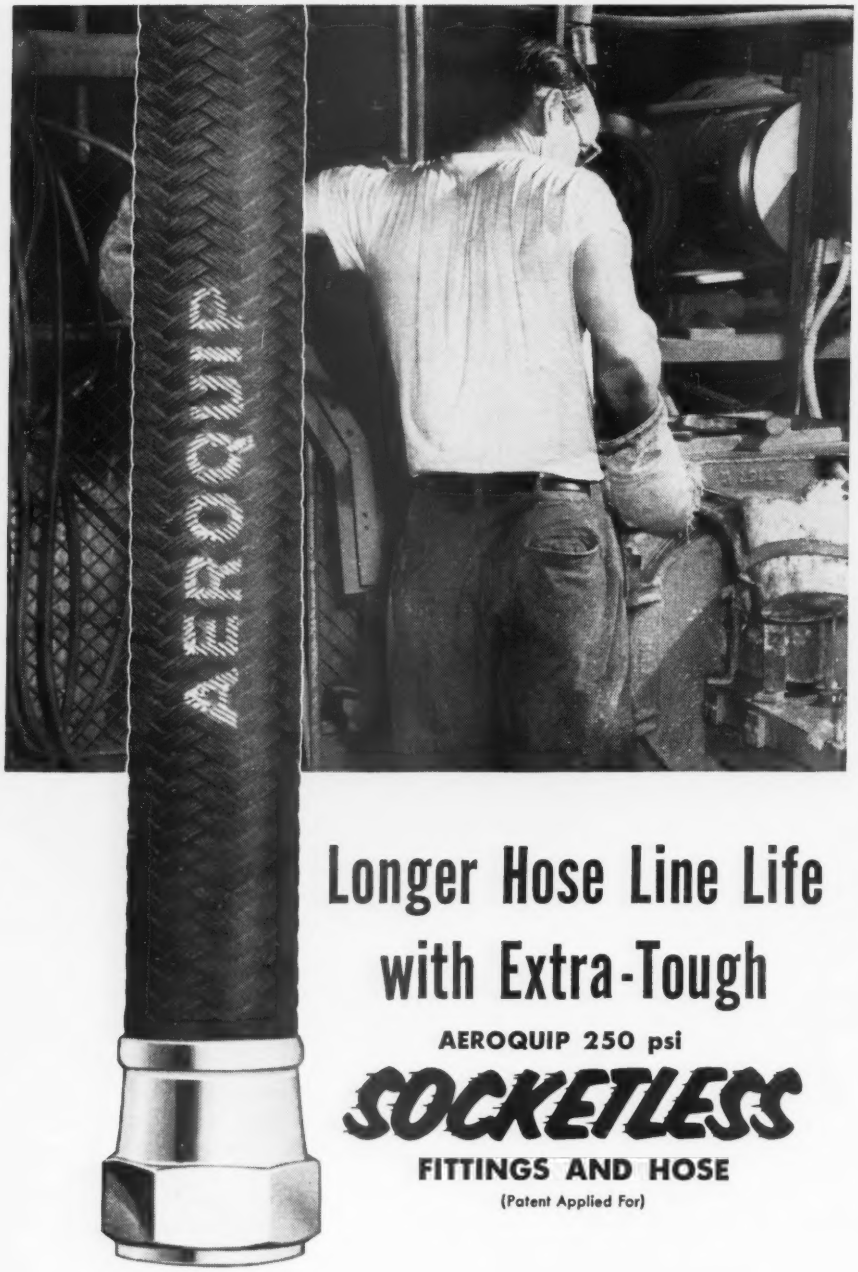

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designed for the year 1986.

Aluminum proved a logical choice for scores of applications—the skin of the giant TWA rocket, inside paneling and structural ribs for the Moonride Theaters, gold anodized exterior paneling for the two principal exhibit buildings, flagpoles, railings, light standards, sun shade supports, to name just a few.

The metal, as might be expected, was used to full advantage in the Kaiser Aluminum exhibit. The exhibit occupies 2700 sq ft and tells the story of aluminum—its history, abundance, advantages, versatility and present and future uses.

The entrance to the exhibit is a giant aluminum telescope, weighing more than 3000 lb and measuring 40 ft long and 8 ft inside diameter. It is focused on an aluminum star.

Booklet Explains How To Make Income Tax Appeal

Methods by which a small business owner can appeal Internal Revenue Service findings on his income tax are explained in a new leaflet just issued by the Small Business Administration. If the IRS determines that a businessman owes more or less taxes than he has calculated, the company owner can appeal his case to both the Internal Revenue Service and the United States Courts, should he so desire.

The booklet, "Appeal Procedure for Income Tax Cases," explains in detail the steps in an appeal procedure. It is No. 64 in the SBA's series of management aids and can be obtained from any of the agency's field offices.

Publishes Lecture Series

The Institution of Metallurgists, London, England, has issued an illustrated, paper-bound collection of lectures delivered at the group's 1954 refresher course. It contains five papers by experts in the fields covered.

Contents include "The Inspection of Metals in Service" by G. A. Cottell, "Inspection in the Steel Industry" by J. F. Hinsley, "Inspection of Non-Ferrous Metals" by S. S. Smith, "The Assessments of Methods of Destructive and Non-Destructive Testing" by H. Harris and "Batch Testing and Sampling of Metals" by H. J. Curnow. Copies are obtainable from the Registrar-Secretary, Institution of Metallurgists, 28 Victoria St., London, S. W. I., England. Price is 15s. 6d.

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The 8 gang dump box shown in this unretouched photograph was made from the single wood master core plug and backing frame. The same method may be used for two part split or booked type core boxes with flat or irregular partings. Added savings plus greater accuracy are assured when properly cleared white metal or aluminum master dryer patterns are also made by this same process.

There is real profit in this idea for you. Hundreds of foundries are now using this modern streamlined method of making core boxes and master dryer patterns because it is accurate, saves machining and offers large savings in the more intricate and gang type core boxes.

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Foundry Developments

By EDWIN BREMER
Metallurgical Editor

ADDITIONAL information on the rotary indexing molding machine under development by W. F. & John Barnes Co., Rockford, Ill., as mentioned in the October issue, indicates that it will handle flasks from 14 x 18 x 8 in. (cope and drag 16 in.) up to 20 x 30 x 17 in. (cope and drag 34 in.), or a round flask 20 in. in diam with a 17-in. depth for cope and drag. It will handle a maximum of three sets of cope and drag patterns. Production, as previously mentioned, is 120 molds per hour. Machine requires only one operator, but cores must be set by others. Sequence of operations at the six stations of the machine are: Blow off pattern and load flask; fill flask with sand from volume controlled hopper; jolt and squeeze; strike off; remove sprue sticks, and strip and unload molds.

Lead Hurts Properties

PRESENCE of lead in cast iron, according to G. Oestberg in an article in *Gjuteriet* (Stockholm), July issue, lowers tensile and impact strength and increases hardness. Quantitative tests as well as practical experience indicate the maximum tolerable Pb as 0.010 per cent with reference to impact strength. Laboratory experiments on removal of Pb by evaporation in an induction furnace showed that at a temperature of 2462°F, removal of Pb was at the highest rate. Other temperatures tried ranged from 2372 to 2552°F in 90° increments. According to the experiments, qualitative solubility of Pb in iron containing 3 per cent TC and 2 per cent Si was 0.020 per cent at 2372°, 0.063 per cent at 2462°, and 0.110 per cent at 2552°F.

Improves Corrosion Resistance

ALUMINUM has been used extensively as a fuel cladding material in water-cooled nuclear reactors operating at low temperature. It is resistant to corrosion by water and does not seriously absorb or interfere with the vital energies at work within the reactors. However, at temperatures above 400°F, aluminum and common aluminum alloys have poor corrosion-resistant properties; this has prevented their use in most commercial designs for high-temperature power-producing nuclear reactors. Research work conducted by Joseph E. Draley and W. E. Ruther, Argonne National Laboratory, Lemont, Ill., indicates that addition of small amounts (½ to 1 per cent) of nickel and iron to aluminum produces an alloy which is impervious to penetrating corrosion up to at least 660°F. Commercially pure aluminum may be protected up to 530° F by adding minute amounts of nickel sulphate to the water, which is acidified by addition of sulphuric acid.

Pushbutton Operation

MECHANIZED searching of metallurgical literature is the goal of an experimental program recently adopted by the American Society for Metals. The society is sponsoring a pilot operation to test the feasibility and utility of computing or automation type equipment for the purpose. Work will be conducted under a contract with the Center for Documentation and Communication Research, School of Library Science, Western Reserve University, Cleveland. The society points out that need for better methods of retrieving and correlating metallurgical literature is urgent because the point is being approached where it is cheaper to do a research job than to spend time, effort and money to perform an adequate search of literature by conventional methods.

Simplifies Analytical Procedure

WHILE rapid spectrographic procedures can be used to control composition of complex high-temperature alloys used in jet engines, the alloys first must be analyzed carefully by chemical methods for comparison. In addition to cobalt, nickel and chromium, these alloys contain niobium (columbium), molybdenum, tungsten and titanium. This makes chemical separation difficult. Work at National Bureau of Standards by Hague, Maczkowske and Bright has resulted in an accurate procedure for analyzing such alloys through use of ion exchange or differential retention of metal ions on surfaces of certain resins. Details are presented in "Determination of Nickel, Manganese, Cobalt and Iron in High-temperature Alloys, Using Anion-exchange Separations" in the *Journal of Research,* National Bureau of Standards, 53, 353 (1954) RP 2552.

Manganese for Nickel

ACCORDING to Allegheny Ludlum Steel Corp., Pittsburgh, additional austenitic steels in which manganese has replaced a large part of the nickel now are available. During the Korean War an alloy containing about 15 per cent Cr, 15 per cent Mn and 1 per cent Ni was offered. New alloys include one composed of 17 per cent Cr, 4 per cent Ni and 6 per cent Mn, and one containing 18 per cent Cr, 5 per cent Ni, and 8 per cent Mn. The first, designated AISI type 201, has properties similar to AISI type 301 containing 17 per cent Cr and 7 per cent Ni. The other, designated AISI type 202, has properties similar to AISI type 302 containing 18 per cent Cr and 9 per cent Ni.

Improves Properties

APPLICATION of subsonic vibrations during the solidification of high-alloy material for gas-turbine blades is discussed briefly in the Sept. 1 issue of our British contemporary, *Foundry Trade Journal.* Frequencies of 48 and 23 vps and amplitudes of 0.005 and 0.12-in. were employed. Results indicate that both frequency and amplitude are contributing factors, with frequency the more important. With application of vibration the grain size is reduced considerably, and the physical properties increased. Pouring temperature also has an important effect; greater values were obtained with a pouring temperature of 1550°C (2822°F) than with a temperature of 1520°C (2786°F). At the higher temperature and vibration the elongation was increased 14 per cent, the reduction of area 33 per cent, ultimate tensile strength 16 per cent. It is believed that the improvements in the properties are due to removal of the typical columnar crystal structure and substitution of a uniform equi-axed grain structure and probably a reduction in porosity and a more uniform distribution of the usual real segregation.

BASIC NEWS
FOR CUPOLA OPERATORS

Basic Refractories offers field service to foundries

Cupola operators interested in adopting a basic practice can get information and help from Basic Refractories' engineers. These men know refractory application and are familiar with cupola practice.

BASIC SLAG SYSTEMS REDUCE SULPHUR CONTENT OF IRON 50%

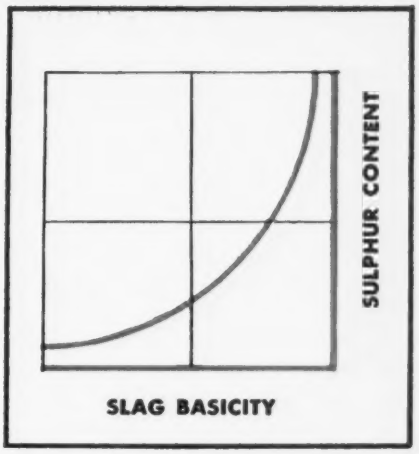
Where low sulphur is desirable in producing special irons, like ductile, basic slag systems save money because of their ability to absorb sulphur from the metal and coke charge. Cupolas operating basic can produce iron with a sulphur content approximately one-half of that produced in an acid cupola. Basic slags also bring about conditions that increase the tendency of iron to absorb carbon.

The following table indicates approximately the sulphur contents that can be expected with slags of various basicities.

SLAG BASICITY	SULPHUR CONTENT
0.8 or lower	.08% or higher
0.8 to 1.3	.08% to .04%
1.3 or higher	.04% or lower

Within limits, the higher the basicity ratio of the slag, the better its desulphurizing properties. Basic slags have lime available to react with sulphur contained in the charge. The sulphide formed is many times more soluble in the slag than in the iron.

Operations employing basic slags are only possible when a basic lining is used.



Basic linings for cupolas offer 8 advantages

Costs of basic linings and maintenance refractories are higher than those of acid materials. But these costs are offset by the following advantages:

1. **Lower sulphur content in the iron produced**
2. **Greater carbon pickup**
3. **Higher metal tap temperatures**
4. **Use of lower cost charges**
5. **Absence of bridging and clean drop**
6. **Better pouring characteristics of metal**
7. **Less scrap castings**
8. **Steel scrap can be substituted for low-phosphorous pig iron without lowering the total carbon content of the iron.**

HOW TO CALCULATE DEGREE OF SLAG BASICITY

Cupola Charge:

Steel scrap		3800 pounds
Pig iron		600 pounds
Ferrosilicon		200 pounds
Total metal		4600 pounds
Limestone		300 pounds
Coke		800 pounds

Silicon (Si) Charged:

Steel scrap	(.45% Si)	3800 × .0045 = 17.1 pounds
Pig iron	(1.00% Si)	600 × .0100 = 6.0 pounds
Ferrosilicon	(50% Si)	200 × .5000 = 100.0 pounds
Total silicon charge in metal		123.1 pounds

Silicon (Si) Tapped in Metal:

Metal (1.3% Si) . . . . . 4600 × .0130 = 59.8 pounds

123.1 − 59.8 = 63.3 pounds silicon (Si) lost to slag. When silicon (Si) is oxidized to silica (SiO_2), 28 pounds of Si will produce 60 pounds SiO_2, therefore:

63.3 × (60÷28) = 135.6 pounds SiO_2 to slag.

Silica from Coke:

800 pounds coke (10% ash which is 50% acid oxides)
800 × .10 × .50 = 40 pounds acid oxides from coke.
135.6 + 40 = 175.6 pounds total SiO_2 or equivalent to slag.
(Note: If sprue is charged with sand coating, this SiO_2 should also be added to above.)

Limestone ($CaCO_3$) Charged:

100 pounds $CaCO_3$ = 56 pounds CaO when burned, therefore:
300 × (56 ÷ 100) = 168 pounds total CaO to slag.
Thus, the approximate CaO to SiO_2 ratio is:
168 ÷ 175.6 = .95

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NEWS REPORTS FROM

Chicago . . . New York . . . Pittsburgh . . . Los Angeles . . . Philadelphia

Los Angeles— Continued sniping at foundries by smog enforcement officials has overshadowed one of the best third quarters experienced by foundries in this district in many years. For most shops, the third quarter exceeded the like period of 1954 by 7 to 12 per cent, and even the usual summer slack season failed to halt zooming sales charts. The smog situation is something else again.

With the formation of a new smog alert program, foundries are continuing to bear a major portion of the political baiting. In the new system, smog alerts are identified by color, with a situation labeled "smog red" forcing a shutdown of heavy industry. The Los Angeles Chamber of Commerce, hitherto a bulwark in the foundry industry's fight to resist attack, passed a resolution opposing the introduction of new industries in the Los Angeles basin until such time as effective smog control remedies have been found.

To most foundrymen, the barring of new industries comes at a disadvantageous time. Several months ago, using optimistic Chamber of Commerce reports as a gage, many foundries made costly plans for expansion to serve the many new industries expected to develop in Los Angeles in the next decade. "Several steel foundries have spent thousands of dollars in expanding to take care of expected new business," one foundryman said. "Any suggestion that new industries be barred for an undetermined time period will not only discourage further foundry expansions but also mean a lot of money down the drain for foundries with aggressive management".

Despite their displeasure over the Chamber's suggestion, foundries continue to play an active role in the fight against smog. "We breathe the stuff too," a foundryman said. "We don't like it either."

Philadelphia—Foundry business is good here. Most shops are operating a full five-day week and some six days. Backlogs gradually are becoming more extended. Some operators believe October will be the most active month so far this year, once all returns are in.

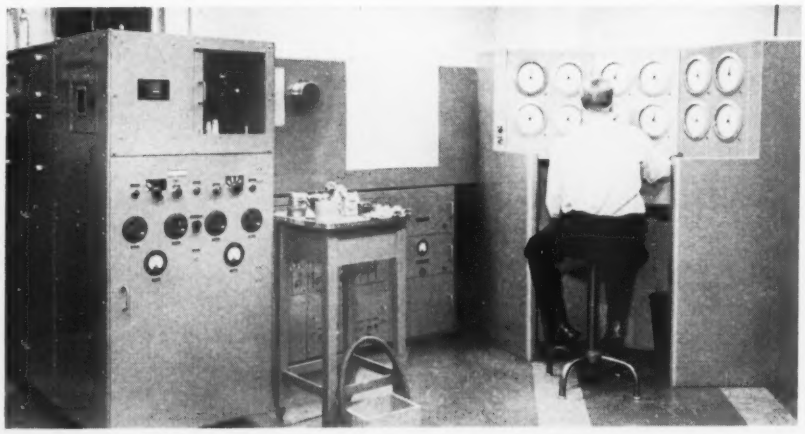
Diversification of demand is encouraging. Gray iron foundry operators claim inquiry seems to be coming from all directions—for various types of heavy equipment, and machine tools (which normally do not cut too great a swath in this district), and for various construction requirements. There is a stepping up in auto die work, which is affecting not only cast iron but steel as well. Demand for cast pipe is off somewhat seasonally, but there is still plenty of this work around.

Some gray iron shops can still make delivery within two to three weeks, where patterns are available; however, the over-all average appears to be better than that, nearer four to five weeks.

Steel casting delivery promises range six to eight weeks and appear to be getting tighter. Demand is brisk for valves, conveyor equipment, industrial trucks, speed reducer housings, construction and mining equipment.

Malleable shops report continued good demand for pipe fittings, hardware, heavy truck components and railroad needs. These shops are running five to six days a week, with average delivery promises around six weeks. Bronze and brass shops are booked ahead at least a month on an average, with most shops running at full normal. One weak spot in nonferrous demand here is ship work. To date this district hasn't reflected in important measure the improvement that is getting under way in the shipbuilding industry. Nevertheless, this is a situation that should improve with the turn of the year, as considerable work is in prospect.

Light metal shops are doing well, especially those with aircraft work.



MORE BERYLLIUM COPPER: Beryllium Corp., Reading, Pa., has almost completed a 2-yr, $2 million expansion program, of which this giant direct reading spectrometer is a part. Located in a 20 x 30-ft air-conditioned room, it speeds melting operations and provides high quality control of beryllium copper alloys. The firm expects a rapid increase in the use of beryllium copper casting ingot. Other new facilities increase the company's wrought alloy finishing capacity by 60 per cent

Pittsburgh—With mill operations remaining near capacity, there's constant demand for replacement of equipment. In October, Mesta Machine Co. put its foundry on a six-day week operation, due to the greater volume of mill equipment demand. Company officials say backlog of work has increased this year. Customers continue to demand quick delivery. Previously the foundry had been operating four or five days a week.

Pittsburgh will become the head-

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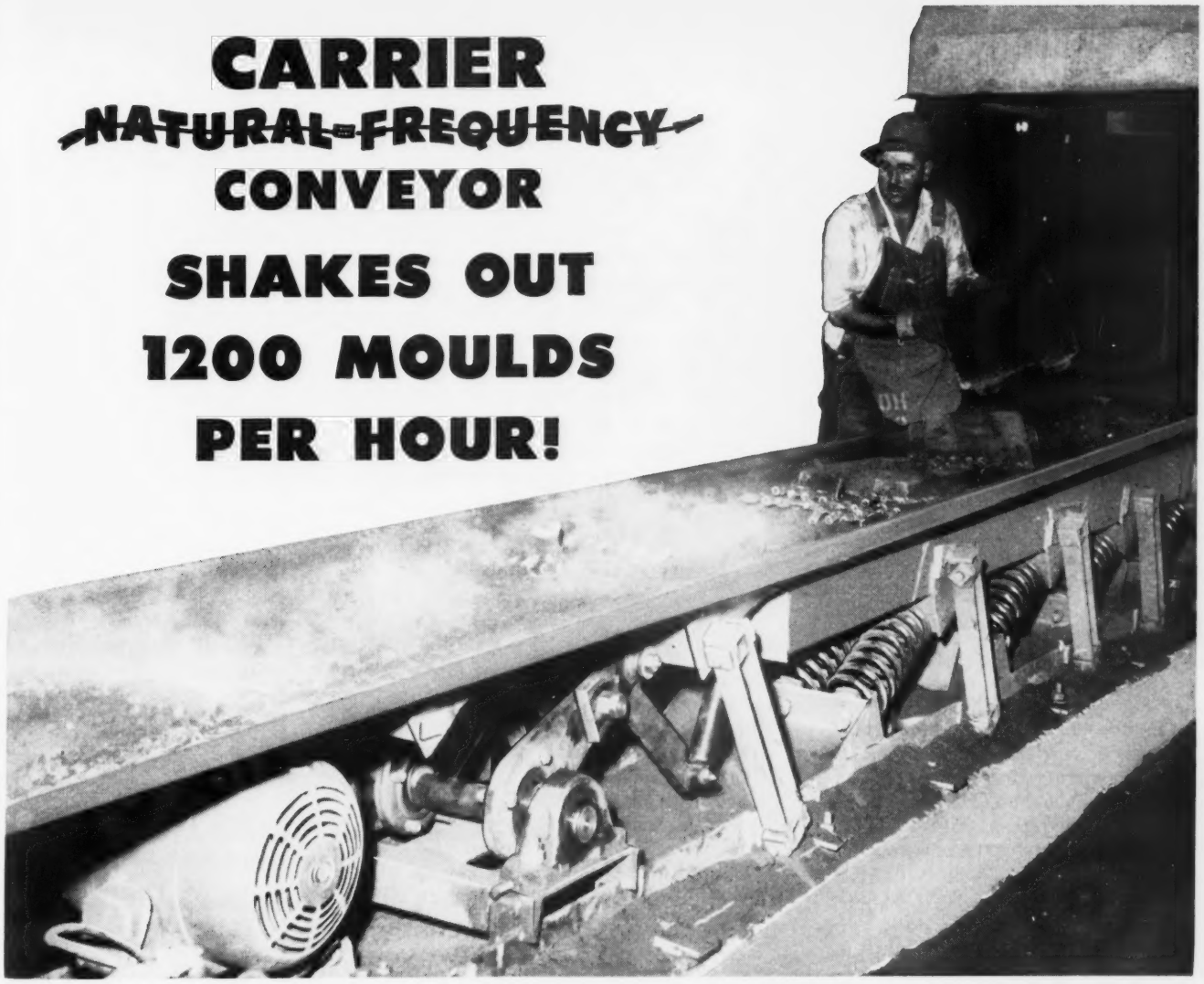

The 35-foot, 5 H.P. Natural-Frequency Conveyor shown above is a real glutton for punishment. It shakes out and conveys 1200 8x14x16 moulds of brass castings per hour — a rugged, heavy-duty job involving from 60 to 100 tons of sand per hour, plus castings!

Carrier Natural-Frequency Conveyors are now delivering spectacular conveying and shakeout performances for scores of foundry operations throughout the country—from the smallest precision castings on up to extremely large, heavy castings. Mail the coupon for all the facts, *today!*

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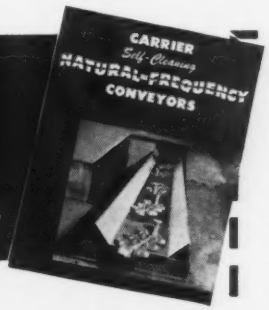

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quarters for three of the largest mill machinery builders when the purchase of Continental Foundry & Machine Co., East Chicago, Ind. by Blaw-Knox Co., Pittsburgh, is completed. Mesta and United Engineering & Foundry Co. are two other leading firms located here.

Shipments of castings to automakers and shipments of ingot molds continue to be leading fields of foundry activity in early fourth quarter. Railroad consumption of castings is rising but still none too brisk, and some foundries formerly serving railroads are seeking to expand into a wider range of products. A heavy building and construction season has taken up much of the slack left by the lag in railroad purchases.

New York—District gray iron shops are operating at the best level so far this year. Most foundries are running at around 80 per cent of full capacity, with capacity representing a 5-day week operation of full working forces. A couple of shops are running even higher.

Construction needs are important, but gray iron operators say there has been a general improvement, including better demand for machinery castings. Delivery promises are becoming more extended at around four to five weeks.

Malleable capacity in this area is limited and this has tended to accentuate the pressure on existing shops, especially from manufacturers of hardware and electrical fittings. Also, there is a good demand for ornamental work. Relatively little business is coming from the railroads and automotive manufacturers, there being few of these buyers in the area. Delivery promises on malleable appear to range around eight to ten weeks, with shops on a full five-day schedule.

Brass and bronze shops are quite busy. This applies to jobbing plants as well as to most captive shops. Considerable tonnage is going into valves, pumps, pipe fittings and meters. Shipyard requirements have stepped up. Aluminum shops are doing well. Those not engaged in aircraft work are doing very well in other lines, especially for components for household appliances.

Chicago— Powerama, the "World's Fair of Power," which General Motors Corp. sponsored on Chicago's lakefront, Aug. 31-Sept. 25, recorded an attendance of 2,218,412. Company officials were highly pleased with their undertaking.

Having exceeded the anticipated 2 million visitors, and having been favored with good weather during the 26-day run, the Corporation chose not to exercise its option to continue the event an extra 10 days. It was announced there are no plans to present Powerama in other cities.

Those who attended will recall that the castings angle got a play with GM's Fabricast Division conducting an operating exhibit.

Foundries in this area are looking for an active fourth quarter, making quite a contrast with 1954 final quarter. Orders for castings are increasing and backlogs are extending comfortably. Part of the strength stems from the booming automobile assemblies as new models get rolling. However, general demand for castings is such that jobbing foundries are working longer hours and increasing melts.

Sales of pig iron in September did not quite come up to expectations, but October was showing prospects of good improvement. Viewing prospects for the next three months as good, gray iron foundries for the most part are operating 40 hours per week or better and backlogs range from a minimum of 3 weeks to a maximum of 6 months. Current operations average about 85 per cent of capacity.

GANGWAY! BY J. A. PATTERSON

"Oh, cut out them fancy maneuvers and get it skimmed!"

Displays Cast Iron Art Pieces At Birmingham Art Gallery

Through its devotion to and interest in cast iron as a medium from which to make useful as well as beautiful objects, the American Cast Iron Pipe Co., Birmingham, has made available to its employees and the general public the opportunity to see the largest private collection of cast iron art objects in the world.

The Lamprecht Collection of Cast Iron Art was once owned by Gustav Lamprecht, professor of graphic art, University of Leipzig, Germany. He spent his life and fortune assembling the objects. In 1922, the collection was sold to Max Koehler of Los Angeles and St. Louis. After Mr. Koehler's death, the American Cast Iron Pipe Co. became the owner.

The 917 pieces that make up the collection are on exhibit at the Birmingham Art Gallery. Fine jewelry, statuettes, candlesticks, vases, household utensils, coins, medals, medallions and sacred ornaments make up some of the impressive groupings. As the models from which the art was cast have nearly all been lost or destroyed, the pieces can never be duplicated.

Pamphlets describing the collection will be mailed to those who write United Oil Mfg. Co., 1429 Walnut St., Erie, Pa.

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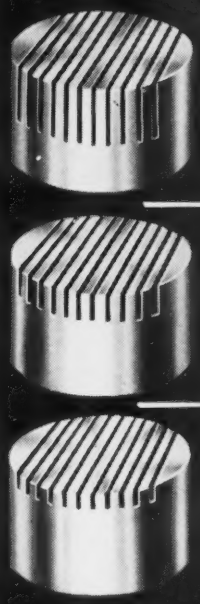

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MALLEABLE FOUNDERS CONSIDER POTENTIAL

Discuss Future Market at Their Fall Meeting

By FRANK G. STEINEBACH
Editor

HOW CAN the malleable iron foundry industry develop and maintain a level of profit which will support the improvement and growth needed to meet the requirements of an expanding economy? What is the future market for malleable castings? These and other questions relating to the future potential for malleable iron castings were discussed at the annual fall meeting of the Malleable Founders' Society held at Cleveland, Sept 23.

Considering the problem of profit and future growth, Carl L. Liebau, president and treasurer, Federal Malleable Co., West Allis, Wis., and president of the society, pointed to a probable labor shortage in the next decade and the need for increasing capital investment. Since the movement toward mechanization and modernization already is under way, the society now has undertaken a study to determine the progress of the industry in keeping abreast of modern trends through capital investment.

Discussing the need for a better understanding of growth measured in terms of potential markets, Mr. Liebau stressed the importance of future planning by the industry. Efforts should be made to determine how many castings the industry might expect to sell during the next year, five years from now or in the fabulous decades which are predicted by all leading economists and spokesmen for American industry if the malleable iron industry is to share in the prosperity of an expanding economy. Mr. Liebau asked the interesting question, "Is our industry prepared, in terms of estimated market potential backed up with realistic plans for modernization and expansion, to get a share of the money that will be spent in reaching the predicted economic levels for 1965?"

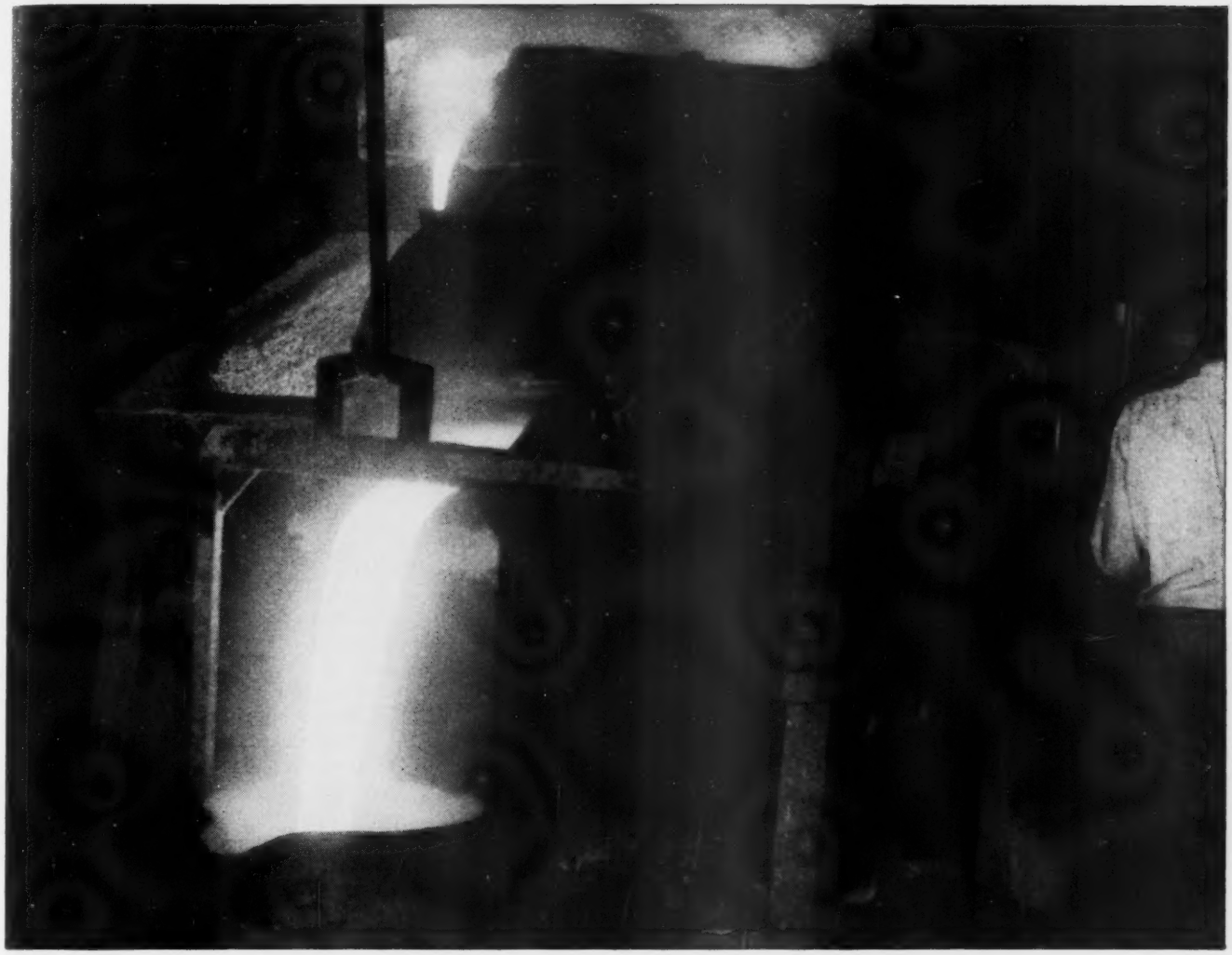
Both the president and J. W. Hallock, Albion Malleable Iron Co., Albion, Mich., chairman of the Market Development Committee, stressed the value of two sales engineering clinics, one to be held at the Hotel Biltmore, New York, Nov. 3, and the second at the Drake, Chicago, on Nov. 11. Discussion will center around three questions: "What do we know about our market potential? How much confidence do we have in the future of our industry?" and "How can we proceed to find out about our market potential?" Announcement also was made that the Seventh Market Development Conference will be held at the Edgewater Beach Hotel, Chicago, Apr. 12-13, 1956.

Stephen E. Kelly, Eberhard Mfg. Co. Division, Eastern Malleable Iron Co., Cleveland, and chairman of the welding committee, presented a progress report on the studies of that group during the last year. Through the excellent co-operation of a number of member companies, the committee has completed a large amount of work on the welding of both malleable and pearlitic malleable castings. Although the results of these tests are not conclusive, the committee believes that they provide optimism for the project. The committee also is working with the Welding Research Council and the Engineering Foundation on the project.

William A. Kennedy, Grinnell Co., Providence, R. I., chairman of the technical council, reported that the Bureau of Standards will announce shortly the availability of white iron standard samples. He predicted that the sample will prove quite beneficial for the malleable iron industry. Mr. Kennedy also stated that ASTM Committee A-7 and the technical council of the society have requested the ASTM to start a study on corrosion of malleable iron. The request will come before the ASTM Advisory Committee on Corrosion shortly.

James H. Lansing, technical and research director, reported that the study of the behavior of malleable castings at elevated temperatures is progressing well at Purdue University. Results of this work should put malleable iron in position for use in applications subjected to elevated temperatures. Part V of the gating and feeding project is well under way. The study concerns the effects of feeding distance, multiple feeding, gate location, feeder shape and other factors. The study on primary graphite in heavy malleable sections continues.

E. J. Walsh, executive director, Foundry Educational Foundation, Cleveland, presented a progress report to the society, one of the founding members of the foundation. Mr. Walsh stated that 68 per cent of MFS members also are contributing members of FEF. After discussing the reason for the establishment of the foundation, he pictured the growth that may take place in the next 10 to 20 years and emphasized



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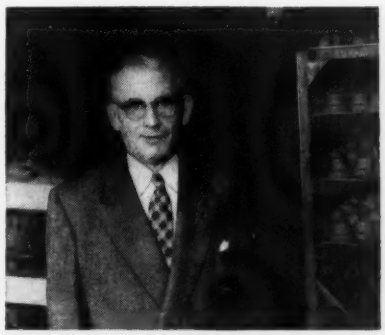
Enot Foundry uses Cities Service No. 62 Core Oil for all cores, from 5 ounces to 5000 pounds



SURROUNDED BY CORES stands H. Sleicher, Treasurer in Charge of Sales. Having just switched to Cities Service No. 62 Core Oil, he reports it dries 20% faster, increases production, lowers costs.

Located in Wayne, Michigan, Enot Foundry is one of the oldest foundries in the State and has enjoyed continuous operation under the same management since its formation in 1921.

With a melting capacity of 50 tons per day, Enot turns out automotive, machine tool, and business machine castings, as well as many others . . . castings from 5 ounces to 5000 pounds! Yet for every one, Enot uses the same core oil . . . Cities Service No. 62!

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In foundry after foundry, the story varies but the praise continues . . . praise for Cities Service Core Oil. Find out why. Call in a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

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that more trained men will be needed to meet the demands which will be placed on the industry. He stated that out of 500,000 employees in the foundry industry, 37,000 are in the management category and one-half of these require engineering knowledge. He predicted that replacements for the management team increasingly will come from the engineering schools.

Following luncheon, the members discussed general problems of the industry.

Chicago Gray Iron Founders Hold Quarterly Meeting

A tour of the Hansell-Elcock Co. gray iron foundry marked the quarterly meeting of the Chicago Management Group of the Gray Iron Founders' Society on Sept. 22. It preceded a luncheon roundtable meeting, held at the Graemere Hotel. John M. Gajentan Jr., vice president, Chicago Foundry Co., and president of the group, presided.

E. Harold Mitchell, newly appointed field director of the society, made his first appearance before the Chicago group and discussed the organization's promotion and merchandising plans for the coming year. R. T. Lewis, Keene Foundry Co., Griffith, Ind., retiring director of the society from the eighth district, reviewed recent society activities.

Members of the group regard business prospects for the next three months as good. Most shops are operating 40 or more hours per week, with backlogs ranging from 3 weeks to 6 months, and the operating rate based on maximum commercial demand averages about 85 per cent.

The group will meet on Nov. 29 to elect officers for 1955-56.

Book Review

Industrial Furnaces, Vol. II, 3rd ed., by W. Trinks, cloth, 6 x 9 in., 358 pages, published by John Wiley & Sons Inc., New York. Price $10.

Many changes have been made in the third edition of this work. Every chapter has been revised, and two-thirds of the text has been rewritten. Illustrations of obsolete equipment have been deleted, and 117 new illustrations were added. This edition brings readers abreast of advances in the field since 1941, when the second one was prepared. Mr. Trinks is a leading authority on industrial furnace design and construction. The Trinks Award is given in his honor once a year to three or four men for outstanding achievement in industrial heating.

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Man to Man

By RALPH L. LEE

Within Our Means

"The shortest cut to the best life has to offer is down the path of learning how to live within our means, whatever their nature"

OFTEN have I thought that many foundry people and companies made up of foundry people would be amazed at the small margin of superiority which separates their performances from those of the people and firms they envy.

Mr. Micawber in Dickens' *David Copperfield,* on one of his short vacations from the debtors' jail, said (you'll remember), "My piece of advice, Copperfield, is this: Annual income twenty pounds, annual expenditure nineteen, nineteen six, result happiness. Annual income twenty pounds, annual expenditure twenty pounds, ought and six, result misery. The blossom is blighted, the leaf is withered, the God of day goes down upon the dreary scene, and—and in short you are for ever floored. As I am."

Maybe Dickens exaggerated a bit in placing the margin separating solvent happiness and bankrupt misery at 12 pence, one-quarter of 1 per cent for the year, but I feel quite certain that it's not too far out of line to make one fearfully important point. And the point I have in mind is not just monetary by any means.

I am sure that most of us know many folks and concerns who never quite catch up with their work or meet their promises, who do everything under pressure of the fear of the possible consequences of their tardiness. Boys on the bench, on the floor, on the machines, on the cupola or on the sand, not quite up, working in sort of a frenzy under the pressure of a steadily increasing debt.

Patternmakers, straw bosses, foremen, superintendents and yes-managers chasing around like chickens with their heads off, in a stew, being threatened and hounded by promises they have failed to keep and by some sort of fearful day of judgment.

On the other hand, I am sure that we all know folks on almost every job, post or position who seem to move at a leisurely pace, yet make every lick count. Although it would be almost an impossible task to study and analyze the detailed motions of the members of these respective groups, the best effort in this direction no doubt would prove that superior brains were not responsible, or education, training or what-have-you, but simply the ability to live and work within their means and on schedule.

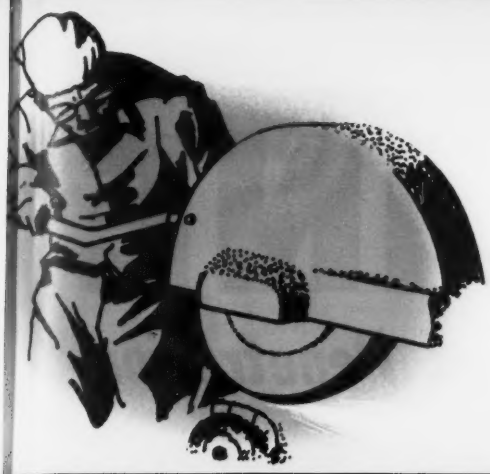
I haven't the slightest doubt that even this most valuable accomplishment would only exceed that of the poor, harried boys of the other group by some small margin on the order of the one recommended by Micawber to David Copperfield.

I have been wanting to say something about this very important matter for a long time because I have no doubt that many a young fellow starting out in the foundry business —and some who are not so young— would start going places if they knew what a small difference there is between run-of-the-mine mediocrity and excellence. They should realize that starting from where they are, with the talents they have, the job and the opportunity, they can spark off a whole chain reaction by getting on top of their present assignment. After all, it's got to start from where we are with what we've got.

Being out of debt, workwise and moneywise, too (they're practically inseparable), we can do much better work. In other words, we can use our talents and ability more profitably for ourselves and everyone else involved. In fact, I often have wondered whether natural-born talent hasn't been given too much credit for outstanding accomplishment.

Ida Tarbell, who at one time held the world's record for interviewing outstandingly famous and accomplished people, was asked whether she had found anything in common among all of the wonderful people she had visited. "My! What a question," she answered. "There were tall ones, short, skinny, fat, quick, slow, soft spoken, loud—but wait a minute, now that I think of it, there was one characteristic in common to all of them. Every single one of them seemed to have forgotten themselves completely, how they appeared to others or where they stood in relation to others and were able to concentrate the ability they had (great or small) onto one concentrated burning point, the point at hand."

There is no question in my mind that if any of us can get rid of all the cat-and-dog interferences that keep running through our heads, haunts of what we could have done but didn't, and of ghosts of debts (both work and money) and concentrate the talent we have on the job



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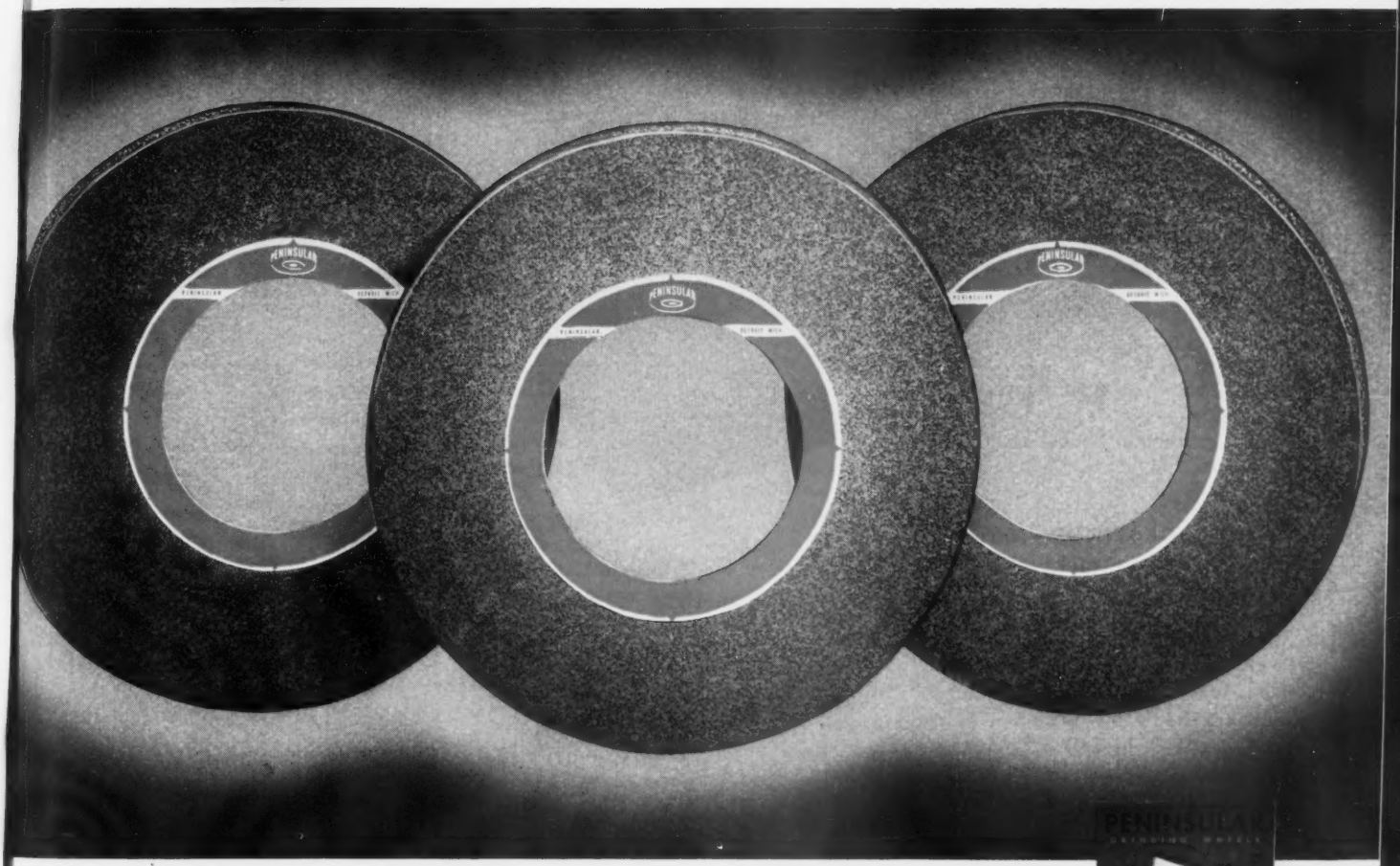

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ADDITIONAL USES — Ideally suited for lining cupola spouts and runners, tap-out holes and patching below the metal line, for lining or repairing bottoms of small furnaces used for melting nonferrous metals.

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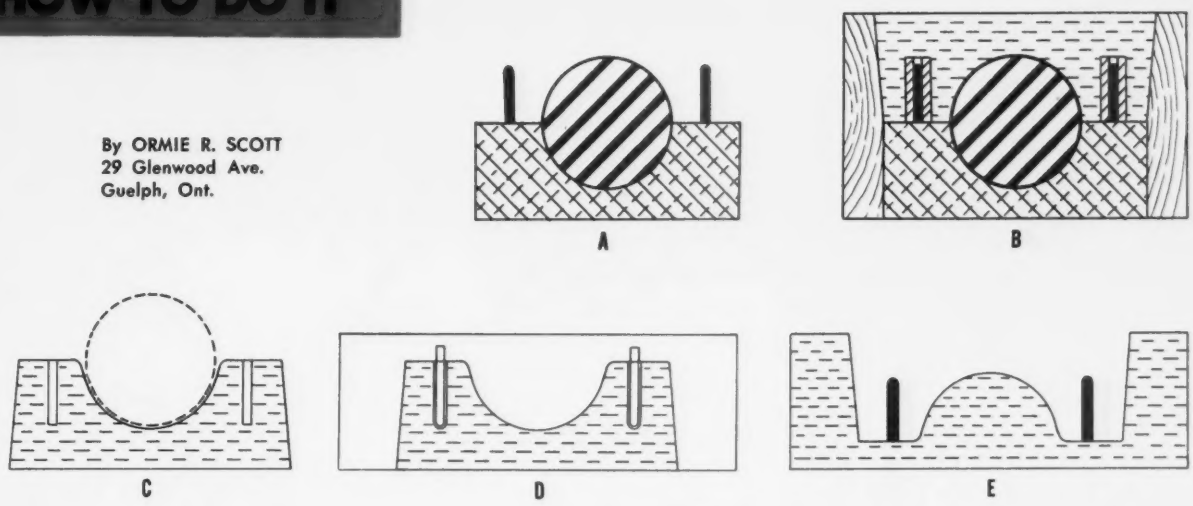
HOW TO DO IT

By ORMIE R. SCOTT
29 Glenwood Ave.
Guelph, Ont.



High Strength Oil Sand Driers Have Use for Certain Jobs

HIGH STRENGTH oil sand driers might be used for low-production core jobs that do not warrant the expense of aluminum driers, yet have high enough volume to make green sand bedding too costly. Making such driers is not too difficult and is outlined here.

First step is to make a plaster core in the conventional corebox. When the core is dry it is greased and placed in the greased drag half of the corebox as shown in Fig. A. A wooden frame is built around the drag and female dowels positioned on the guide dowels. Plaster is poured into the frame and over the greased core and corebox half to form a plaster model of the core drier, as shown in Fig. B.

Fig. C illustrates how this model is cut back for the desired core clearance. The model then is shellacked and greased, male dowels inserted in the locating holes and a wooden frame built around the model as shown in Fig. D. High strength gypsum cement is poured around the model to produce the box, Fig. E, from which many oil sand driers can be made.

Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

at hand, and if we keep this up, the payoff is going to be a whole lot greater than we had figured on. Time, of course, is a most important factor.

I do hope that age is not bringing out the paternalism in me to a boring point, but even at the risk of it, I feel duty bound to share with you the basic truth that the shortest cut to the best life has to offer us is down the path of learning how to live within our means, including time, talent, opportunity and money.

Offers Noise Control Data

Handbook of Acoustic Noise Control is a newly available 315-page supplement to the Air Force's Vol. I, *Physical Acoustics*. It enlarges and expands coverage of the original volume to present the latest experimental and theoretical information available in the field of noise control. These two reports, with Vol. II, *Noise and Man*, a study of the effects of noise on human behavior, comprise a comprehensive, up-to-date study of the generation and control of noise.

Prepared for the Aero Medical Laboratory, Wright Air Development Center, it is PB 111200S and may be ordered for $8 from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Vol. I, 397 pages, is PB 111200 and costs $4; Vol. II, 271 pages, is PB 111274 and costs $3.

Plans Research Conference

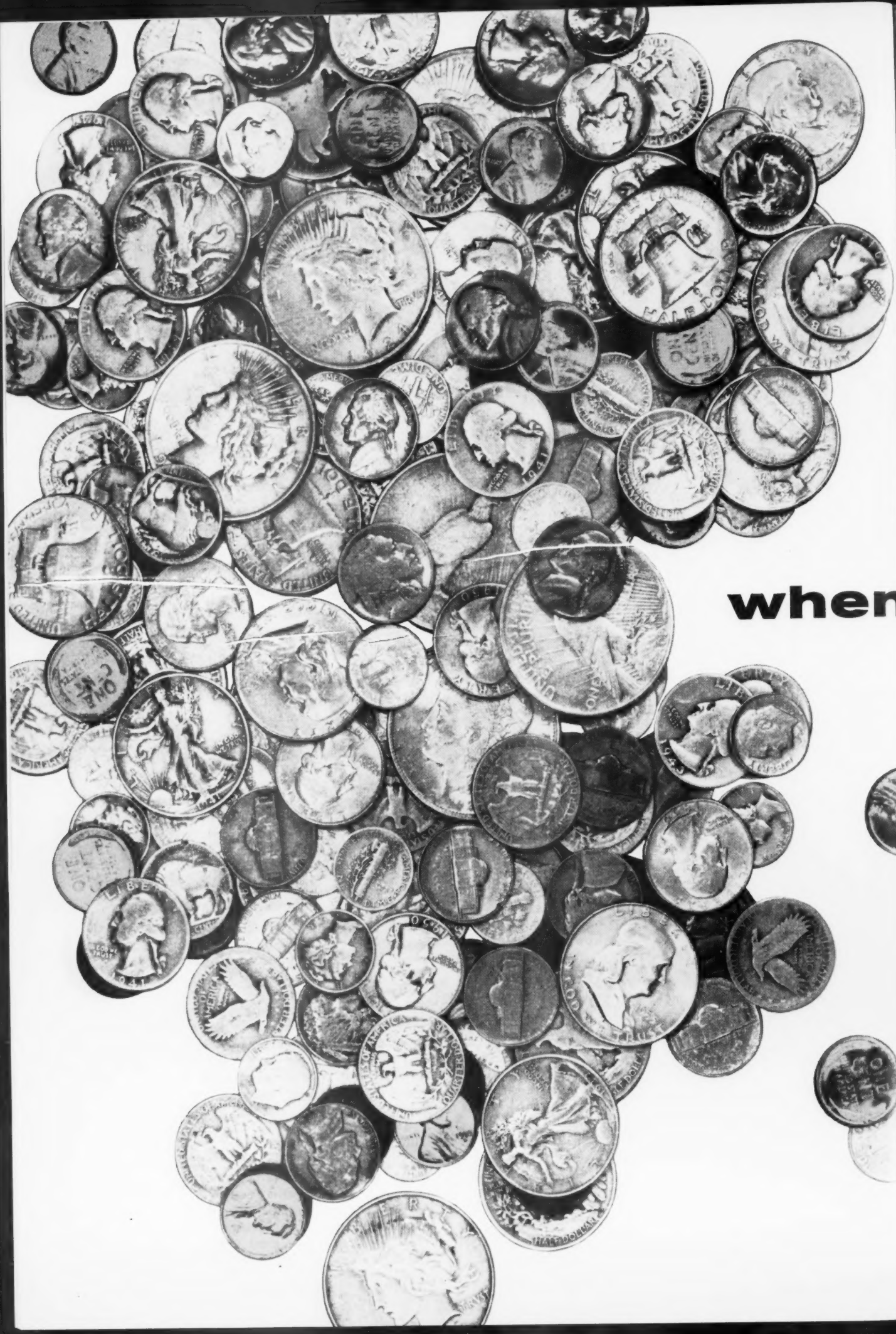
"Research for Profit" will be the theme of the National Industrial Research Conference to be sponsored by Armour Research Foundation of Illinois Institute of Technology, Chicago, April 18-20, 1956. The meeting will be held on the Illinois Tech campus.

It will highlight a series of 12 technical meetings planned as part of the foundation's 20th anniversary in 1956. A number of leading industrialists and research directors will participate in the three-day program, which is designed to guide industry in the administration of more profitable research than before.

Gray Iron Founders' Society Conducts Safety Survey

Gray Iron Founders' Society, Cleveland, is conducting a safety survey among its members to gather information for use as the basis of a new safety program for the society. From the results of questionnaires mailed to about 2300 jobbing and captive foundries, the group's safety committee hopes to set up a program that will reduce both frequency and severity rates in the industry.

Chairman of the safety committee is E. W. Burne, General Electric Co., Schenectady. Other members are H. E. Bromer, Decatur Castings Co., Decatur, Ind.; W. R. Pritchard, Zenith Foundry Co., West Allis, Wis.; H. M. Heuer, National Motor Castings Division, South Haven, Mich.; and Emil Oltean, Forest City Foundries Co., Cleveland.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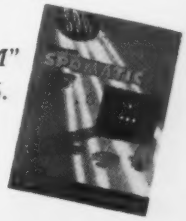

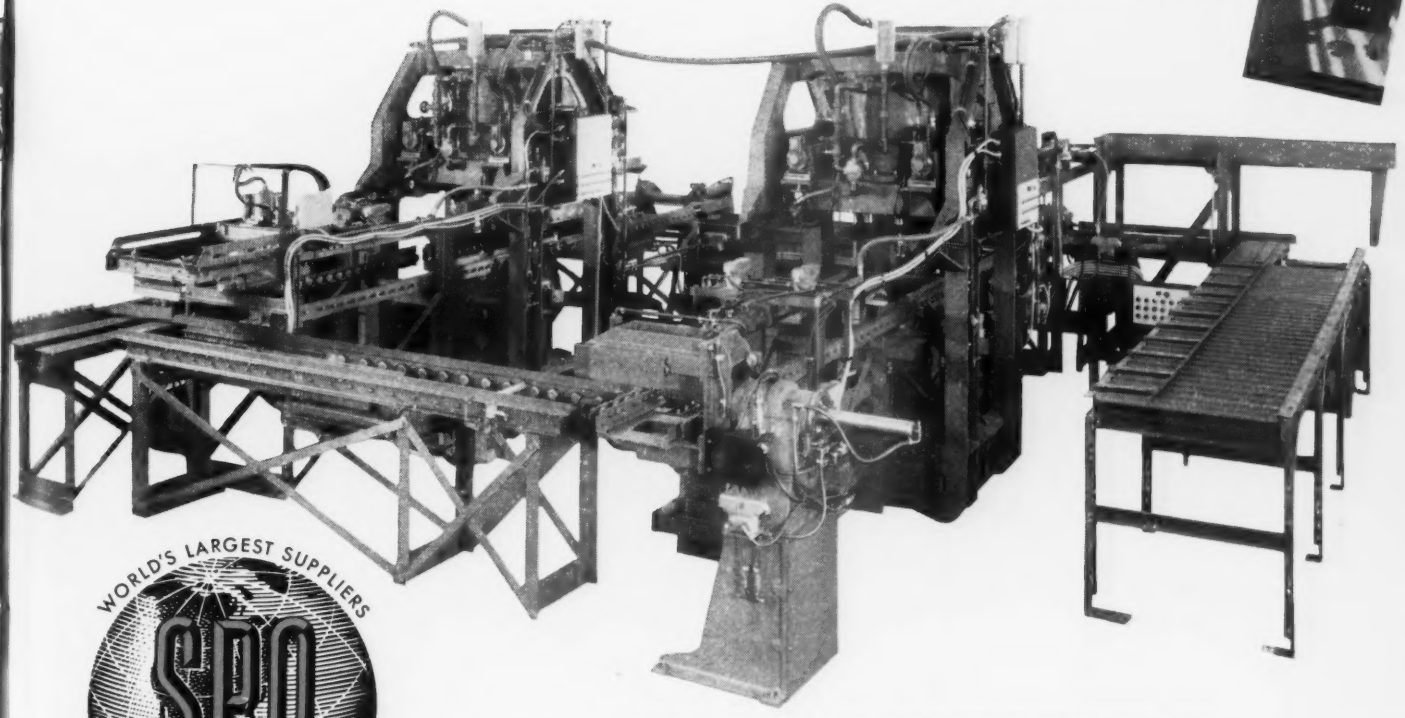

WORLD'S LARGEST SUPPLIERS SPO OF MOLDING MACHINES

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Photo courtesy of Hyster Co.

Fork-truck with shovel attachment dumping sand

Photo courtesy of Frank G. Hough Co.

Handling coal in a malleable iron foundry

Photo courtesy of Caterpillar Tractor Co.

Unit performing clean-up job around a foundry

Front-End Loaders

SPEED BULK

FOR a number of years foundries have been giving increasing attention to lightening the labor and speeding the process of bulk material handling through greater use of mechanical equipment. This machinery may and does take various forms; one of the most versatile types which has been widely adopted is the tractor-mounted shovel, or front-end loader, as it is commonly known.

These loaders have been found useful for hauling a variety of materials, as indicated by the accompanying illustrations. Sand probably is the principal item handled, not only from railroad cars to stock piles, but also in transfer during such subsequent operations as

Photo courtesy of Napco Industries Inc.

Bringing in a shovelful of sand from the yard

Photo courtesy of Jaeger Machine Co.

Moving a load of sand through narrow aisles

Photo courtesy of Tractomotive Corp.

Sizeable loads are easily handled by these units

Photo courtesy of Kwik-Mix Co.

Moving castings to an outdoors storing station

By JOHN E. HYLER

MATERIALS HANDLING

mixing, molding and reuse or disposal of the sand.

Other materials handled include coal and annealing pot packing gravel in malleable iron foundries, castings, sand binders, refractories and refuse. In the winter these loaders prove efficient in disposing of snow.

Size of some units permits them to maneuver easily in narrow gangways or to enter a box car for unloading of sand.

In some instances, front-end loaders have been teamed with portable conveyors for depositing bulk materials in elevated storage. An accompanying view shows such an application, in which sand is fed through an opening in the foundry roof.

Photo courtesy of Baker-Lull Corp.

Loader permits placing the sand where wanted

Photo courtesy of Clark Equipment Co.

Transporting sand to a side floor of a foundry

Photo courtesy of Allis-Chalmers

Portable conveyor used with a front-end loader

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ACTIVITIES of Foundry Groups

Twin City: "Inspection Tools in the Foundry" was the subject of Norman Qualey, plant engineer in charge of metallurgical inspection, Northern Pump Co., as he addressed 95 members of the AFS Chapter at the Sept. 20 meeting at the Covered Wagon Restaurant, Minneapolis. H. H. Blosjo, Minneapolis Electric Steel Castings Co., chapter chairman, presided. J. Roth, Progress Pattern & Foundry Co., technical committee chairman, introduced the speaker.

Mr. Qualey said that specifications are a guide from the engineer and should be established after carefully analyzing the endless requirements of castings. According to the speaker, the misapplication of inspection is the worst fault in the use of inspection tools in the foundry.

Inspection serves two major purposes: Preserves the integrity of the company by reducing the number of casting failures and is a means for establishing manufacturing procedure. Mr. Qualey blamed management for not using good inspection methods in some cases, almost with an attitude of being afraid to find something wrong. Rather, he emphasized, the attitude should be that inspection is an aid to production by enabling them to find faults early to allow time for control or elimination of the causes.

A display of inspection tools of the kind discussed in the talk were on exhibition and detailed information about them was distributed.—*Robert J. Mulligan. Archer-Daniels-Midland Co.*

Chicago: On Oct. 3 more than 300 members and guests of the AFS Chapter assembled at the Chicago Bar Association to hear a discussion of the CO_2 Process by Hans J. Heine, technical director of the AFS. James T. Moore, vice president, Wells Mfg. Co., chapter chairman, presided at the dinner meeting. Robert P. Schauss, Chicago manager, Werner G. Smith Co., technical chairman, introduced Mr. Heine.

Mr. Heine's presentation consisted of a critical review of the process, a series of slides, a movie showing the process in use in Germany and a question and answer period. He discussed the fundamentals of the process, sand preparation, coremaking and molding, methods for applying the gas, range of applicability and limitations and advantages.

The chapter's Nov. 7 meeting will be designated as Robert E. Kennedy Scholarship Night and the annual Ladies' Night has been set for Feb. 11 at the Knickerbocker Hotel.

For the Nov. 7 chapter meeting, four roundtables are arranged. Bradley H. Booth, Carpenter Bros., Milwaukee, will speak on "Foundry Sands" before a joint meeting of the Steel and Malleable divisions; Clarence Holmes, Citizens Gas & Coke Utility, Indianapolis, will discuss "Manufacture and Application of Foundry Coke" at the Gray Iron session; and Carl W. Zersen, Chicago Lighting Institute, will elaborate on the topic "Are You Working in the Dark?" at the Maintenance division meeting. Nonferrous and Pattern divisions will combine to discuss "Permanent Molding."—*Erle F. Ross.*

Canton: First meeting of the AFS District Chapter for the 1955-56 season was held Oct. 6, at the Swiss Club, Canton, O., with some 95 members and guests attending. Harold A. Biddinger, F. E. Myers & Bros., Ashland, O., chapter chairman, presided. W. W. Snodgrass, Massillon Steel Castings Co., Massillon, O., program chairman, introduced the speaker, Carl O. Schopp, assistant general superintendent, Link-Belt Co., Indianapolis.

Mr. Schopp labeled his talk "Shell Molding" and elaborated upon the shell molding program at his company. He discussed some of the basic procedures necessary in getting started, some of the difficulties encountered, as well as the final results which incorporated automatic molding and assembly equipment. R. R. Kozinski, Canton Malleable Iron Co., Canton, O., was host to the speaker. —*R. R. Kozinski, Canton Malleable Iron Co.*

Ontario: Royal Connaught Hotel, Hamilton, Ont., was the site of the Sept. 23 meeting of the AFS Chapter as some 150 persons met to hear E. E. Woodliff, sand consultant, Detroit, discuss "pH Factor of Molding Sand." W. Bryce, International Harvester Co., presided at the meeting and Willard Jones, Canadian Westinghouse served as technical chairman.

Mr. Woodliff's talk introduced a new factor useful in the pH control of molding material. Speaker pointed out that although two different molding samples may exhibit the same pH value, each may require a different amount of additive to neutralize it. The factor representing this characteristic of the molding mixture is called "buffer strength." In the speaker's opinion, this factor is more meaningful than just the pH value in determining the correction necessary.

Buffer strength is determined by placing a weighed amount of material in distilled water. Resultant so-

NEWLY ELECTED directors of the Northern California Chapter of the AFS as they appeared at a recent meeting. Left to right are Hugh Prior, superintendent, Superior Electro-Cast Foundry Co., South San Francisco; David Sutch, sales, Brumley-Donaldson Co., Oakland, Calif.; Harold Wegner, plant superintendent, Pacific Foundry Co., San Francisco and Harold Lolley, plant manager, Vulcan Foundry Co., Oakland, Calif. Photo by courtesy Albert Harris and Associates

CHESAPEAKE Chapter of the AFS, Southern Section, met recently and elected new officers. Left to right are Walter Kelly, Lynchburg Foundry Co., treasurer; L. A. Howell, Newport News Shipbuilding and Dry Docks Co., vice chairman; J. S. Parrish Jr., Richmond Foundry & Mfg. Co., chairman and Don Mathieu, Kerchner Marshall & Co., secretary of the new group.

lution is titrated with a solution of hydrochloric acid or sodium hydroxide of known strength. Amount of acid or base that is required can be used to determine amount of additive required. Each additive has a value relative to the standard solution of hydrochloric acid or sodium hydroxide. An electric titrimeter is useful for the titration procedure.—*Dave Magder, United Smelting & Refining Ltd.*

Chesapeake: An organizational meeting of the Southern Section of the Chesapeake chapter of the AFS was held at Hotel Chamberlin, Old Point Comfort, Va., on Sept. 23, with 66 persons present. Following officers were elected: J. S. Parrish Jr., Richmond Foundry & Mfg. Co., Richmond, Va., chairman; L. A. Howell, Newport News Ship Building & Dry Docks Co., Newport News, vice chairman; Walter Kelly, Lynchburg Foundry Co., Lynchburg, treasurer and Donald E. Matthieu, Kerchner Marshall & Co., Richmond, secretary. November meeting is scheduled for Greensboro, N. C.—*Paul L. Huffman, Virginia Foundry Co.*

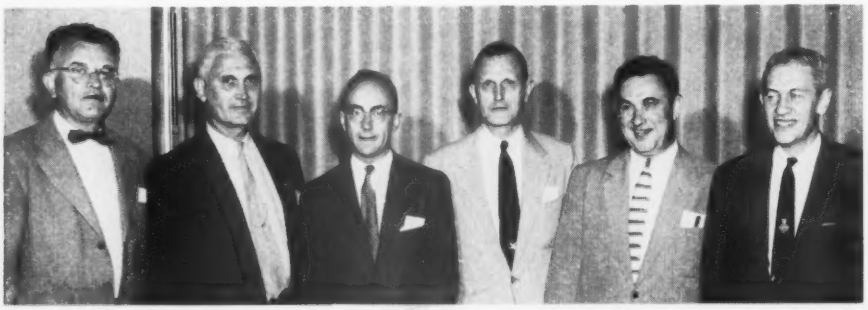
Pittsburgh: Pittsburgh Foundrymen's Association assembled 125 strong at Webster Hall Hotel, Pittsburgh, on Sept. 19 to hear William G. Gude, managing editor, FOUNDRY, review what has happened in the foundry industry in the last ten years and point out some of the trends indicated for the future.

Mr. Gude reported that the number of gray iron foundries is now 20 per cent below the postwar peak. Malleable foundries are 15 per cent below their peak. Steel foundries show a slight increase in 1955 over other years due to an increase in number of investment casting foundries. Aluminum foundries continue to increase rapidly—surpassing the number of gray iron foundries for the first time.

During the last ten years there have been slight geographical shifts in location of foundries. California is the second largest foundry state, following Ohio, in number of plants.

In a comparison of casting methods, the speaker stated that sand casting holds its lead, although foundries with sand casting have declined 10 per cent in number since their postwar peak in 1947. There have been significant increases in number of permanent mold and die casting foundries.

Mr. Gude indicated that present foundry capacity is capable of meeting today's needs, but warned that to reduce costs foundries must continue to increase total output per worker through use of more efficient equipment and must seek to expand markets by working more closely with design engineers.—*Robert Love.*



PITTSBURGH Foundrymen's Association honored its new officers at the group's first meeting of the new season on Sept. 19. Featured speaker was W. G. Gude, managing editor, FOUNDRY, who discussed "What's Ahead for the Foundry Industry?" Left to right are George Miklos, Westinghouse Electric Corp., director; H. C. Stirling, Rolls Division, Blaw-Knox Co., chapter president; R. H. English, National Alloy Division, Blaw-Knox Co., immediate past president; Mr. Gude; Earl J. Biller, Vulcan Mold & Iron Co., vice president and E. P. Buchanan, Pittsburgh Coke & Chemical Co., secretary-treasurer. Other directors are H. P. Spilker, Sterrit-Thomas Foundry Co.; J. J. Munro, Richmond Radiator Co. and I. W. Sharp, American Steel Foundries

Wisconsin: First monthly meeting of the AFS chapter for the 1955-56 season was held at the Hotel Schroeder, Milwaukee, on Sept. 9. Following dinner, sectional meetings were held.

For the gray iron group, William Hambley, sales engineer, Charles A. Krause Milling Co., talked on "Casting Defects." T. H. Tanner, Zenith Foundry Co., acted as chairman. The malleable group was addressed by G. J. Riddle, vice president, Illinois Clay Products Co., with W. R. Kerner, Milwaukee Malleable & Gray Iron Works as chairman.

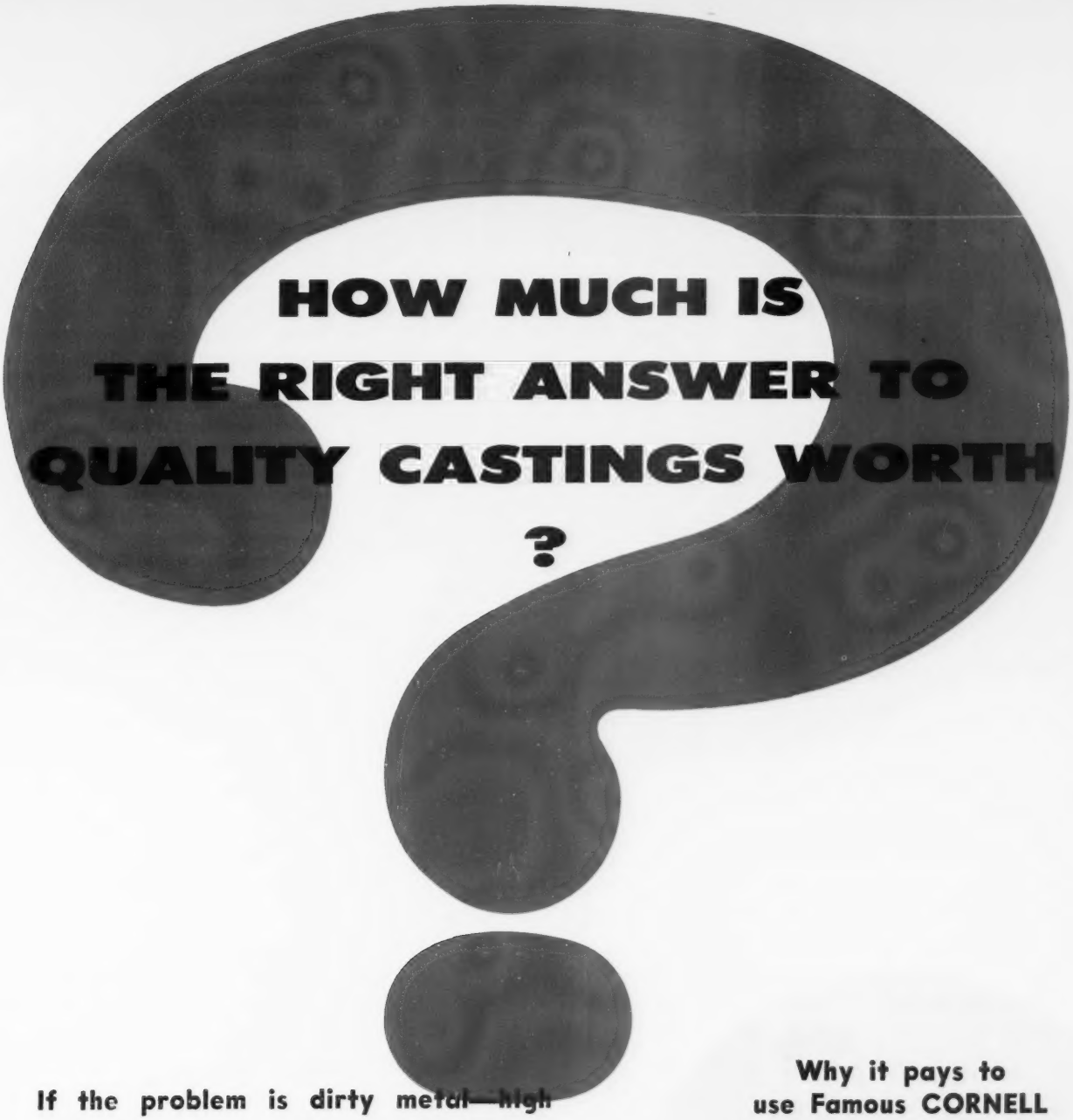
R. P. Schauss, Chicago manager, Werner G. Smith Inc., addressed the nonferrous group on "Cause and Corrections of Core Defects." E. H. Jagmin, Ampco Metal Co., was chairman. Pattern group heard D. S. Linton, industrial sales department, U. S. Gypsum Co., talk on "Tooling With Plastics." E. Czerwinski, Nelson Pattern Co., chairmanned this group.

C. W. Vokac, Hydro Arc Division, Whiting Corp., spoke to the steel group on electric furnace equipment, relating the latest developments in this field. E. Martinek, Maynard Electric Steel Co., served as chairman.—*John E. Hubel.*

Northwestern Pennsylvania: About 60 members and guests of the AFS chapter met Sept. 26 to hear Michael Bock, Exomet Inc., Conneaut, O., give a talk and demonstration on insulated and exothermic risers. Mr. Bock showed slides on the effects of standard risers against insulated risers with reference to casting soundness, yield and heat loss by convection and radiation. A question and answer period followed.—*W. J. Yahn, American Sterilizer Co.*

Western Michigan: Over 1000 foundrymen in the Western Michigan area converged on the Pontaluna Golf Course, Muskegon, Mich., on Aug. 13 to enjoy the 15th annual stag outing of the AFS chapter. Golf, horseshoes and baseball were the chief interests of the day. Dinner was followed by professional entertainment.—*Joe Cannon, Muskegon Aluminum Foundry Co.*

San Antonio Section: Thirty-seven members and guests of the AFS chapter met Sept. 26 at Alamo Iron Works. Election of officers was held and Edward Pruske, foundry



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superintendent, Alamo Iron Works, will serve as chairman for 1955-56. Cochairman is Walter Raynes, Kincaid-Osburn Electric Steel Co. Frank Fournier Jr., F & J Pattern Works was elected secretary and treasurer.

A safety film, "Easy on the Eyes," was shown followed by a talk on "Melting of Cast Iron and Steel," by Charles McGrail. Meeting was adjourned following service of refreshments sponsored by the Alamo Iron Works.—*Frank A. Fournier Jr., F & J Pattern Works.*

Connecticut: John M. South, technical service engineer, Foundry Services Inc., Columbus, O., discussed the CO_2 Process before the Sept. 21 meeting of the chapter of the Non-Ferrous Foundrymen's Association at Shuttle Meadow Country Club, New Britain, Conn.

The speaker illustrated his talk with slides showing curves on the effect and influence of variables such as CO_2 gassing time, clay contamination, moisture and sand grain size on the properties or quality of the cores. Various methods of distributing the gas using multiple tubes and increasing the gas pressure for even distribution according to size or thickness of cores or molds were shown.

A practical demonstration showed the steps in producing a sample core using dry silica sand with about 4 per cent silicate binder, rammed into a corebox and then passing CO_2 gas through it for about 30 seconds.

Speaker cited advantages of the process including speed, no driers, no fumes, small capital outlay, better adherence to tolerances and accuracy of castings. Answers to questions from the floor indicated that mulling time is 2½ to 3 minutes and over-mulling causes stiffness prematurely; contaminated sands or moisture should be avoided; graphite can be used as a release agent on patterns; green strength varies from 1½ to 2 lb, depending upon drying time, mulling and grain size; wood flour or pitch is helpful in knockout for bronze castings and water flushing is sometimes used as a knockout method.—*Frank B. Diana.*

Southern California The AFS chapter met Sept. 9 at Rodger Young Auditorium, Los Angeles, to open the 1955-56 season. One hundred twenty-five members attended the meeting to hear Ray Olson, Shell Process Inc., Chicopee, Mass., discuss "Jobbing with Shell Cores and Shell Molds." Mr. Olson elaborated on the potential of shell molds and cores in the average ferrous and nonferrous jobbing shop. His talk was highlighted by slides showing some of the equipment made by his company. —*Edwin J. Worth, Howell Foundry Co.*

Texas: Opening meeting of the new season for the AFS chapter attracted nearly 100 members to the Ben Milam Hotel, Houston, on Sept. 16. The AFS full color sound film, "Study of Fluid Flow of Light Metals Through Vertical Gating Systems," was shown. Discussion of the principles set forth in the film was led by a panel of A. P. Guidi, Texas Electric Steel Castings Co., H. M. Freeman, Texas Foundries Inc., Dan Roberts, Oil City Iron Works and Pete Maenza, Dee Brass Foundry.

Newly elected officers conducted the meeting. James R. Hewitt, Texas Foundries, chairman; W. A. Bearden, M. A. Bell Co., vice chairman and program committee chairman; Herman J. Pfeifer, Electro Metallurgical Co., secretary and J. L. Ennis, Texas Electric Steel Castings Co., are the officers who will guide the chapter for the 1955-56 season.

Lively discussion evolved from the floor but it was generally concluded that the primary design fundamentals demonstrated by the film, such as sprue taper, runner enlargement, gate widening, side risers, etc., held true regardless of cross sectional shape of sprues, runners or gates.—*J. S. Ahrens, National Carbon Co.*

Washington: Forty members and guests of the AFS Chapter met at the Block House, halfway between Seattle and Tacoma, Wash., on Sept. 20. Speaker for the occasion was Ray Olson, sales manager, Shell Process Inc., Chicopee, Mass. William K. Gibb, Atlas Foundry & Machine Co., program chairman, introduced Mr. Olson.

Speaker discussed shell molds and shell cores and elaborated upon some of their advantages. Patterns and coreboxes also were touched upon with the suggestion that coreboxes should be ribbed to provide reinforcement to the outside of the box. Mr. Olson indicated that if the grain distribution were wide, local sands could be used satisfactorily for shell molding. Typical distribution would be 8 to 15 per cent on the pan and 10 per cent on the next four screens. Sand of 80 to 120 mesh is acceptable but 110 mesh, subangular is preferred.—*Edmund F. Riedle.*

Birmingham: Cascade Plunge, Birmingham, was the scene on Sept. 17 of the AFS Chapter's 22nd annual barbecue. About 200 members were in attendance along with several members of the Chattanooga chap-

ter, including W. G. Greiser, superintendent, Ross-Meehan Foundries, chapter chairman; W. M. Hamilton, manager, Crane Co., AFS national director; G. F. Anderson, Tennessee Products and C. A. Johnson, Somerville Iron Works, both directors of the Chattanooga chapter. Holders of lucky numbers were awarded door prizes.—*A. B. Schwarzkopf, U. S. Pipe & Foundry Co.*

Oregon: "Jobbing with Shell Cores and Shell Mold" was the subject of Ray Olson, Shell Process Inc., Chicopee, Mass., as he addressed the AFS chapter at the Heathman Hotel, Portland, on Sept. 21. Eighty members and guests attended.

Mr. Olson described the advantages of the shell process over conventional molding methods for many types of castings. An exhibit of sample ferrous and nonferrous shell castings was shown along with sample shell cores. Color slides were shown illustrating the adaptation of shell molding to jobbing as opposed to long production runs. Speaker stated that his company had poured shell molds which had been stored for one year, with good results. According to the speaker, there is no reason why shell molding sands cannot be reclaimed as long as resins are destroyed by sufficient heat.—*Bill Walkins, Electric Steel Foundry Co.*

Eastern New York: New officers installed at the first meeting of the new season of the AFS chapter on Sept. 20 were Robert W. McArthur, Ramsey Chain Co., chairman, Sigdon A. Eliot, General Electric Co., vice chairman and Louis J. Di Nuzzo, General Electric Co., treasurer. Guy A. Pealer, General Electric Co., spoke on "Pattern Engineering."

Mr. Pealer traced the history of metals from the dawn of civilization, outlining the advances made possible through our use of metals. He emphasized the importance of coordination between designers and casting engineers and need for use of well-engineered patterns even though initial castings may be more expensive than if a cheaper pattern were used.—*Martin L. Slawsky.*

Syracuse Conference Scheduled

Seven New York, Pennsylvania and Canadian Chapters of the AFS will participate in a regional foundry conference scheduled for the Onondaga Hotel, Syracuse, N. Y., Nov. 18-19. Program chairman for the conference is James O. Ochsner, Crouse-Hinds Co., Syracuse, N. Y. The last regional conference in Syracuse was held in 1949.

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- ALGONQUIN CHEMICAL CO., INC. Hamburg, Pennsylvania
- FOUNDRIES MATERIALS CO. Coldwater, Michigan
- FOUNDRY SERVICE CO. Birmingham, Alabama
- F. F. SHORTSLEEVE Elmira, New York
- PACIFIC GRAPHITE CO., INC. Los Angeles 22, California
- ST. LOUIS COKE & FOUNDRY SUPPLY CO. St. Louis, Missouri
- BRUCE-CONREAUX CO. INC. Indianapolis 7, Indiana
- WESTERN INDUSTRIAL SUPPLY CO. Portland 14, Oregon
- MALCOLM G. STEVENS Arlington, Massachusetts

PHOTOGRAPHED AT FLORIDA CYPRESS GARDENS

Smith L-O Core Oil

ROD DIP LIQUID PARTING

SMITH OIL & REFINING CO.

INDUSTRIAL OILS DIVISION • ROCKFORD, ILLINOIS

Obituary

ANDREW C. DENISON, 67, chairman of the board of directors, ciety for two terms from October, land died Sept. 20. He was graduated from Case Institute of Technology and in 1910 joined Ferro Machine & Foundry Co., Cleveland. Later he was associated with Fulton Foundry

ANDREW C. DENISON

until 1921, when he became manager of Euclid Foundry Co., Euclid, O. He returned to the Fulton organization in 1928 as president, and early this year became board chairman. Mr. Denison was chairman of the Northeastern Ohio Chapter of the AFS in 1945-46 and served as president of the Gray Iron Founders' Society for two terms from October, 1941 to 1943.

Ernest F. Hess, 71, until his retirement in 1945, foundry superintendent-metallurgical engineer, Ohio Injector Co., Wadsworth, O., died Sept. 20. A native of Toledo, O., he was graduated from University of Michigan, and previously was associated with Toledo Edison Co., and Champion Spark Plug Co., Toledo, Michigan Malleable Iron Co., Detroit, and H. Koppers Co., Pittsburgh, as chemist and research engineer. He joined Ohio Injector Co. in 1923. A leader in civic and organizational work, Mr. Hess was chairman of the Northeastern Ohio Chapter of the AFS during 1939-40.

Robert P. Tyler, 58, since 1947 vice president-sales, Macwhyte Co., Kenosha, Wis., died Oct. 2. Mr. Tyler joined the company in 1945 as general sales manager and became a director the following year.

John G. Malnoski, 69, former president-general manager, Muncie Malleable Foundry Co., Muncie, Ind., died Oct. 1. He retired in March due to illness. In 1913 he joined a Benton Harbor, Mich., malleable foundry, and 6 years later was one of a group which took over Whiteley Malleable Foundry Co., Muncie, and formed Muncie Malleable with Mr. Malnoski as general manager.

Clayton R. Genung, 56, research chemist, Ross-Meehan Foundries, Chattanooga, Tenn., died Sept. 25. He attended University of Chattanooga and joined the company 22 years ago. Mr. Genung was the author of numerous articles on steel and iron castings.

Robert S. Haff Jr., 39, sales engineer, Norton Co., Worcester, Mass., died recently. He was graduated from Virginia Polytechnic Institute and, prior to joining the company in 1951, was associated with Walsh Refractories, St. Louis.

George Skakel, 63, since 1953 chairman of the board of directors, Great Lakes Carbon Corp., New York, died Oct. 3 when a company plane in which he was a passenger crashed near Union City, Okla.

Henry G. Shields, 76, who retired 5 years ago as vice president-treasurer, Foran Foundry & Mfg. Co., Flemington, N. J., died Sept. 21. He had been with the company 50 years.

Lincoln Kilbourne, 44, general manager-sales, Industrial Division, Jeffrey Mfg. Co., Columbus, O., died Oct. 5. A graduate of Ohio State University, he joined the company in 1934.

Edwin S. Pillsbury, 89, board chairman and one of the founders of Century Electric Co., St. Louis, died recently.

Investment Casting Institute Appoints Committee Chairmen

Four new chairmen of Investment Casting Institute committees have been appointed by Ted Operhall, Misco Precision Casting Co., president of the ICI.

Roger Waindle, Wai-Met Engineering Co., will head the metal specifications committee, succeeding Charles Yaker, chairman for the last two years. V. S. Lazzara, Casting Engineers Inc., is chairman of the program planning committee for the ICI annual meeting this year. Chairman of the group's new educational program committee is George Cannon Jr., Cannon-Muskegon Co. The Institute's nominating committee, which will prepare a list of candidates for consideration at the fall meeting, is headed by K. M. Bartlett, Thompson Products Inc.

Working with Mr. Lazzara on the development of the program for the technical sessions will be Dr. N. J. Grant, P. W. Schipper and Charles Schwartz, Misco Precision Casting Co. L. E. Brooks, L. E. Chaundy Jr. and P. F. Foley will aid in the development of business sessions.

Other members of the education committee include David Veit, Precision Metal Molding; K. M. Bartlett; R. R. Miller, Precision Metalsmiths Inc.; V. S. Lazzara and Charles Schwartz.

Members of the nominating committee include R. S. Banister, Midwest Foundry Co.; W. A. Dubovick, Engineered Precision Casting Co.; H. L. Scott, Scott Casting Mfg. Co., and K. W. Thompson, Thompson Tool Co.

How To Meet Manpower Needs

Management development programs at four varied types of companies, including Gary Steel Works, are described in a new American Management Association booklet, "Meeting Production's Manpower Needs." Aimed specifically at the production group, these programs provide new and useful ideas for executives concerned with making the most of available manpower and developing needed managerial personnel.

Orders for copies of the 39-page publication should be addressed to Publication Sales Dept. P, American Management Association, 330 West 42nd St., New York 36. Cost is $1.75 to nonmembers, $1 to members.

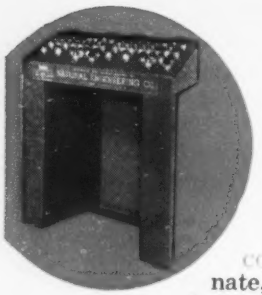
Book Review

A Company Guide to the Selection of Salemen, by Milton M. Mandell. Cloth, 160 pages, 6 x 9 in., published by the American Management Association, 330 West 42nd St., New York 36, N. Y. Research reports No. 24. Price $4.75 ($3.50 to AMA members).

Report discusses and analyzes current practices of 180 manufacturing firms of diverse interests to demonstrate how they select their sales forces, reduce sales staff turnover and improve sales performance. Various types of selection devices are covered in detail with over 50 pages of facsimile reproductions of actual forms.

TIME IS MONEY . . . SAVE BOTH WITH . .

Photo above shows new, compact Mix-Muller installation at Forging & Casting Division, Allegheny Ludlum Steel Corp., Ferndale, Michigan. Unit includes No. 1½F (1000 lb.) Simpson Mix-Muller, National Bucket Loader and National Aerator. National TIME-MASTER controls entire operation in preparing facing, backing and core sand.

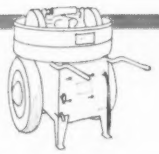


CONSOLE MODEL: An alternate, desk type control panel for the National Timemaster can be provided for convenient location anywhere in the foundry.

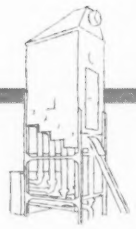
TYPICAL control panel arrangement for Timemaster operation of two No. 3F (4000 lb.) Mix-Mullers. Dials above inspection doors indicate moisture content of batch—through National "Moisture-Master."

PRODUCTS OF THE PRACTICAL FOUNDRYMAN

SIMPSON MIX-MULLERS
25 to 4000 lb. batch capacity

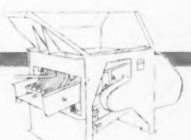


SIMPSON PORTO-MULLER
250 lb. capacity (100% portable)



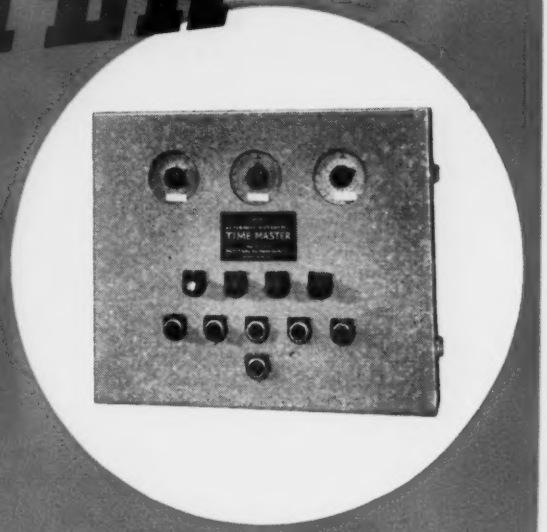
NATIONAL SAND RECOVERY SYSTEM
Practical pneumatic sand scrubber

NATIONAL HYDRO-FILTER
Wet type dust collector



NATIONAL SCREEN MASTER
Screening and magnetic separating unit.

NATIONAL TIMEMASTER®



Nobody "forgets" to add the bond or core oil with the new Mix-Muller installation at the Forging and Casting Division of Allegheny Ludlum Steel Corp. in Ferndale, Michigan. This compact, TIMEMASTER-operated No. 1½ Mix-Muller installation turns out high quality, uniformly mulled backing, facing and core sand fast, and *automatically* with welcome savings in core oil and binders.

Here's how it works:

ON FACING SAND: The number of quarts of water required is set on the panel of the Timemaster control unit. The total cycle is set for mulling and the knob is turned to automatic. When the start button is pushed all phases of mulling are automatic—indicating lights reveal the sequence of operation. After mulling the discharge door opens and mixer is discharged by plow action.

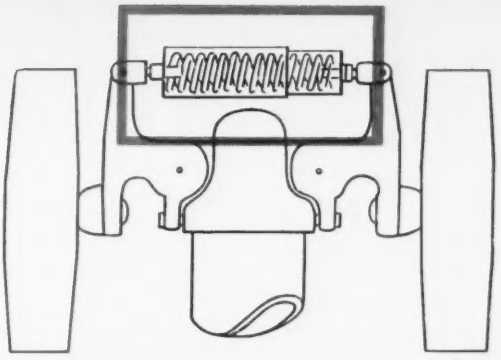
ON BACKING SAND: The backing sand operation is similar to the facing sand mulling sequence. Total cycle time may vary as well as may the moisture additions. The operator re-sets two knobs and the Timemaster again controls the phases of mixing. Quality and uniformity are greatly enhanced.

ON CORE SAND: Quarts of water are set on one dial, quarts of oil on another and total cycle adjusted on the third to automatically provide the proper mixing cycle for core sand mixing. Water and oil, accurately measured and automatically injected into the batch at the proper time, relieve the mixer operator of these tasks and insure maximum uniformity and quality.

AT THE TURN OF A SWITCH you can eliminate the "human element" from your mixing operations with the National Timemaster. Designed to increase production by effective coordination of all phases of the mixing cycle, the Timemaster can also make quality control a reality in your foundry and—automation an everyday tool—working for you. Write today, for details.

Spring loaded mullers mean more mulling per minute . . . per dollar invested.

NOW AVAILABLE on Simpson Mix-Muller models in a batch capacity range of from 50 to 4000 lbs., spring loaded mullers provide the ultimate in control over *every minute* of the sand mixing operation. With this unique innovation, it is possible to *pre-set* muller weights according to the type of sand to be mulled. Maximum muller pressure is exerted as the sand increases in strength during mulling — when pressure is *most* needed.



National Engineering Company
(Not Inc.)
646 Machinery Hall Bldg. • Chicago 6, Illinois

View of a portion of the Engineering and Marine Exhibition, held in London during the first half of September. Section devoted to foundry equipment is in the rear

BRITISH EXHIBITION

Features New Foundry Equipment

By VINCENT DELPORT
European Manager

AN EXHIBIT of foundry equipment was one of the features of the Engineering and Marine Exhibition held at Olympia, London, Sept. 1 to 15. Machinery shown included melting furnaces, molding machines, coreblowers, die and investment castings and shell molding machines, sand reclamation and conditioning units, cleaning devices, ventilation and dust collection apparatus and other products, including foundry supplies.

Among the melting furnaces, an IC Detroit unit for investment casting was shown by Birlec Ltd., Birmingham, which also exhibited, in operation, a 35-kw, low-frequency induction furnace for aluminum and zinc and their alloys. Constructional Engineering Co., Birmingham, showed a scale model of a new design of metallurgical blast cupola and models of other types of cupolas and cupolettes.

Monometer Mfg. Co., London, displayed a fully mechanized 12-ton hot metal receiver for holding iron at pouring temperature. Crucible furnaces and a mechanized 2-ton rotary melting unit for nonferrous metals, iron and steel also were shown. Morgan Crucible Co., London, exhibited several furnaces, among which were a 600-lb hydraulic tilter; a miniature furnace fired by either oil, gas or coke; and a 300-lb, oil-fired, bale-out furnace.

Crucibles for nonferrous melting were displayed by Carborundum Co., Manchester, and by Morgan Crucible Co.

Molding machines were displayed at several booths. British Moulding Machine Co., Faversham, Kent, showed a semiautomatic, shockless, jolt-squeeze-strip machine with pneumatically-operated swinging head. This machine embodies a lifting frame to strip the flask from the pattern, and the frame is fitted with rollers to handle flasks and finished molds. Other machines made by the firm also were displayed. Various types of molding machines were shown by Adaptable Moulding Machine Co., a subsidiary of Constructional Engineering Co., and J. W. Jackman & Co., Manchester, showed a variety of Osborn molding machines, including a pneumatically-operated rotating model.

Pneulec Ltd., Smethwick, Staffordshire, exhibited for the first time its automatic jolt-squeeze-strip machine with two pattern plates which index between two stations. Jolting and squeezing take place at one station and stripping and placement of the empty flask at the other. Operation at both stations is simultaneous, and all operations are mechanically controlled. A film about a Coleman-Wallwork automatic molding machine was shown at the booth of the firm's associated company, Acme Conveyor Ltd., London.

Coreblowing machines were shown by Constructional Engineering Co., which gave the first demonstration of a bench-type machine and of another coreblower. The latest bench-type impulse coreblower by George Fischer Ltd., Shaffhausen, Switzerland, was shown at the booth of its United Kingdom representative, Foundry Suppliers Ltd., London.

Coreblowers also were displayed by Fordath Engineering Co., West Bromwich, Staffordshire, and by Pneulec Ltd. J. W. Jackman & Co. showed a standard Osborn coreblower and a small bench machine, designed for heavily bonded sand, to produce cores weighing up to 8 lb.

Machines for die and investment casting and shell molding were shown by W. J. Hooker Ltd., London, which displayed investment casting equipment, and by Polygram Casting Co., London, which showed a complete range of shell mold and coremaking

the crane with the BOARDING HOUSE REACH

USTIN-WESTERN HYDRAULIC CRANE

ith telescopic boom

It's the LIVE BOOM that puts the A-W Hydraulic Crane out front in the performance parade . . . live power with instant response for all boom movements . . . extending and retracting, raising and lowering, and rotating. Fingertip hydraulic control places the load exactly where it is wanted; handles delicate spotting jobs with superb precision. No other mobile crane has a boom so completely "alive". . . no other outdoor-indoor crane will handle so many jobs, so well.

SEE what it does -

ed with magnet, it does a superb job of transport- vy castings, changing tumbling barrels, and load- tric furnaces.

Especially adaptable to foundry operations—the A-W Hydraulic Crane is the answer to all of your materials handling needs.

Ideal for handling castings, molds and general crane requirements—a big time, labor and money saver in and around your plant.

USTIN-WESTERN COMPANY

Construction Equipment Division • Baldwin-Lima-Hamilton Corporation

AURORA, ILLINOIS, U.S.A.

Power Graders • Motor Sweepers • Road Rollers • Hydraulic Cranes

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Other products: Power Graders, Motor Sweepers, Road Rollers

machines in the display at its booth.

In the sand conditioning and reclamation section, August's Ltd., Halifax, offered a large display, including August-Simpson mullers, one of which was a new type with a batch capacity of 2000 lb. Under U. S. A. license, this firm is making the sand recovery system developed by National Engineering Co., Chicago.

J. W. Jackman & Co. displayed their "five-units-in-one" system, comprised of a sand mill, sifter, magnetic drum, disintegrator and skip loader. Pneulec Ltd. showed its latest Pneulec Royer sand mixer.

Core sand mixers were displayed by British Foundry Units Ltd., Chesterfield, and by Fordath Engineering Co., which exhibited a new sand mixer and its pan mill with worm-gear-driven, silent operation. Sand testing apparatus by George Fischer Ltd. was shown at the booth of Foundry Suppliers Ltd., and Ridsdale & Co., Middlesbrough, showed a complete range of testing equipment.

Rapid development of the CO_2 process was indicated by the number of companies exhibiting products used in it. British Foundry Units displayed CO_2 bonding agents, and British Industrial Sand Ltd., Redhill, Surrey, showed CO_2 process sands. Foundry Services Ltd., Birmingham, exhibited its CO_2 binder, and Harborough Construction Co., Market Harborough, pioneers in the development of the process, also exhibited special supplies for the purpose. Cylinders and equipment for storing and supplying CO_2 were shown by Carbon Dioxide Co., London.

Foundry equipment of diverse types was shown by Constructional Engineering Co. and other firms. Sterling Foundry Specialties Ltd., Bedford, displayed rolled steel flasks and a new slip flask. Compressors were exhibited by Tilghman's Ltd., Broadheath, Cheshire. W. Thos. Ward Ltd., Sheffield, displayed a new type of gas-fired mold dryer designed to dry a 220-cu-ft mold in 5 hr, a 300-lb core sand mixer, a 1000-lb vibratory shakeout and a combined magnetic separator and vibratory screen. Birlec Ltd. exhibited heat treatment equipment and a moisture absorber for compressed air and for humidity control.

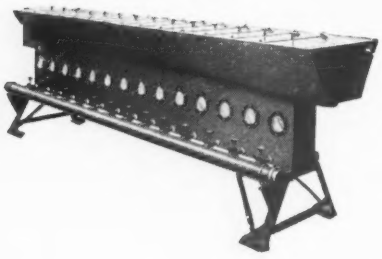
Conveyors were shown at the booth of Acme Conveyors Ltd., which also displayed drawings and photographs of a wide range of mechanized foundry equipment embodying all types of conveyors.

Shows Shot Blasting Equipment

H. G. Sommerfield Ltd., London, exhibited shot blasting equipment, including a centrifugal machine designed for continuous operation. Spencer & Halstead Ltd., Ossett, Yorkshire, displayed a large-capacity barrel machine and a newly developed, fully automatic, continuous-loading unit. Tilghman's Ltd. exhibited a new Wheelabrator Corp. airless, automatic model which accommodates castings up to 18 in. square. The firm also showed a Wheelabrator Corp. rotary blast unit and barrel machines of various sizes.

Ventilation and dust collection was covered by photographs at the Acme Conveyors Ltd. booth. August's Ltd. displayed a National Engineering Co. unit to collect dust by the wet method which it is making under U. S. A. license. Further dust arresting and collecting equipment was shown by Constructional Engineering Co., Tilghman's Ltd. and Dustuctor Co., Hayle, Cornwall.

Foundry supplies, including core oils, binders, blackings, fluxes, facing compound and other materials extensively used by foundries were displayed by many firms.



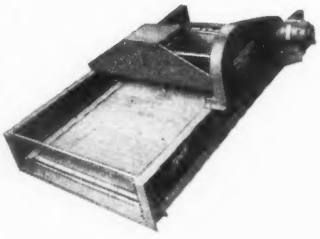
For Economical Cleaning and Re-sizing of Foundry Sand

The CONCENCO® CPC Hydraulic Classifier cleans and sizes new or used foundry sand accurately and economically. Operating by hydraulic water power only, and without moving parts, it removes extremely fine and burned materials as a slime overflow. Desirable sand grains are classified into as many sizes as there are cells in the classifier, and may be recombined to produce a completely satisfactory foundry sand. Send for complete information.

For Screening Economy

For screening of certain difficult foundry sands, the Leahy® No-Blind Vibrating Screen with FlexElex heating of the jacket may well be your answer. The Leahy without FlexElex is also used for dry screening or with washing sprays.

Ask for Bulletin 15-J.



THE DEISTER★ CONCENTRATOR COMPANY

CONCENCO PRODUCTS

★ *The ORIGINAL Deister Company* ★ *Inc. 1906*

935 Glasgow Ave. • Fort Wayne, Ind., U.S.A.

Radiograph reveals several sand inclusions. These must be chipped out and repaired.

Later radiograph shows repairs have made the casting sound—saved the cost of re-casting.

RADIOGRAPHY

teams with Foundry know-how

to produce a sound high pressure valve body

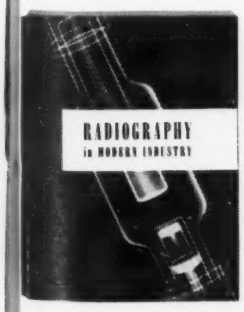
TO TAKE its place in a 300 psi system, this steel valve casting had to be sound. So, it was checked by radiography, revealing the presence of sand inclusions. These were chipped out and the necessary repairs made—a second radiograph showed a sound, homogeneous casting.

This is another good example of the way radiography is used to insure good work, avoid waste, and prevent service failures. It's another example of the way it can improve operations and increase business.

Perhaps you, too, can do this through the use of radiography. Talk to your x-ray dealer. Send for a free copy of "Radiography as a Foundry Tool."

RADIOGRAPHY

another important example of photography at work



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Kodak
TRADE-MARK

NFA officials at their annual meeting. Left to right: William W. C. Ball, Taylor & Fenn Co., retiring president; Paul L. Arnold, United States Pipe & Foundry Co., president; Arthur G. Hall, Nordberg Mfg. Co., vice president

NATIONAL FOUNDRY ASSOCIATION

Discusses Industrial Relations Problems

By WILLIAM G. GUDE
Managing Editor

DISCUSSION of various industrial relations problems occupied the approximately 150 registrants at the 57th annual meeting of the National Foundry Association. The two-day program was presented at the Edgewater Beach Hotel, Chicago, Oct. 6-7.

In the annual election of officers, Paul L. Arnold, United States Pipe & Foundry Co., Chattanooga, Tenn., was named president for the coming year. He succeeds William W. C. Ball of Taylor & Fenn Co., Windsor, Conn. Arthur G. Hall, Nordberg Mfg. Co., Milwaukee succeeds Mr. Arnold as vice president, and Frank J. Sherwin, Chicago Hardware Foundry Co., North Chicago, Ill., was re-elected treasurer.

Mr. Ball presided at the opening sessions and reported briefly on some of the association's activities during the past year. First guest speaker was Dr. Clarence M. Updegraff, University of Iowa, who discussed "Preparation for Arbitration." Dr. Updegraff, a well known labor arbitrator, pointed out that arbitration differs from mediation or conciliation and that the arbitrator must be given complete information on the case if he is to render a fair decision.

The speaker recommended care in the selection of an arbitrator. The broader the arbitrator's background of knowledge, the more likely he is to understand your case fully and to decide it correctly. It is also important that both parties agree beforehand on the exact issue or issues to be submitted for arbitration. Among other suggestions by Dr. Updegraff where these:

Avoid mixing presentation of facts and arguments. Prove your case by your own witnesses, not by evidence gleaned from your opponent's witnesses. Do not interrupt statements of the opposing party or the presentation of its evidence. Make your cross-examination of opposing witnesses brief. Have copies available of all documentary evidence to be presented, including at least one copy for your opponent.

A motion picture, "You Are There at the Bargaining Table," shown at the opening session provided an interesting account of an actual bargaining session between a company's officials and labor representatives. Completely unrehearsed, the film depicted negotiations leading up to the signing of a new labor contract.

"Group vs. Individual Company Bargaining" was a panel discussion in which the relative merits of the two types of bargaining were debated. Frank J. Sherwin, Chicago Hardware Foundry Co., was moderator. Supporting foundries which bargain a group contract were R. J.

NFA administrative council. Left to right, seated, are: Lewis N. Essex, Golden Foundry Co.; Herman Benck, Harnischfeger Corp.; Arthur G. Hall, Nordberg Mfg. Co.; Paul L. Arnold, U. S. Pipe & Foundry Co.; W. W. C. Ball, Taylor & Fenn Co.; Summerfield Brunk, Headford Bros. & Hitchins Foundry Co.; Ray F. Heiden, Galva Foundry Co. Standing: G. A. Euskirchen, Cincinnati Foundry Co.; C. B. Hasty Jr., U. S. Pipe & Foundry Co.; A. L. Dyer, Buckeye Foundry Co.; R. R. Washburn, Plainville Casting Co.; A. V. Martens, Pekin Foundry & Mfg. Co.; George E. Tisdale, Zenith Foundry Co.; C. T. Sheehan, NFA; R. M. Walton, Madison Foundry Co.; R. C. S. Potter, Chemung Foundry Corp.; W. G. Greenlee Foundries Inc.; S. J. Moran, Union Steel Castings Division, Blaw-Knox Co. They are shown at Chicago meeting

This lining for large-size nonferrous furnaces . . .

starts cutting costs even before it's in use

The next time one of your nonferrous crucible furnaces needs relining, put in a CARBOFRAX® silicon carbide liner like the one above and back it up with ALFRAX® castable aluminum oxide cement.

The first thing you will notice is that the new lining saves you time and labor during installation. The accurately molded CARBOFRAX tile make a tight fit that needs no "adjusting." And the ALFRAX cement goes in quickly and easily: just add water and pour.

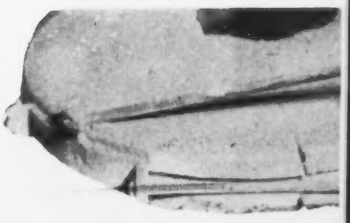
From here on, keep your eye on the furnace's operating costs. You'll discover that—

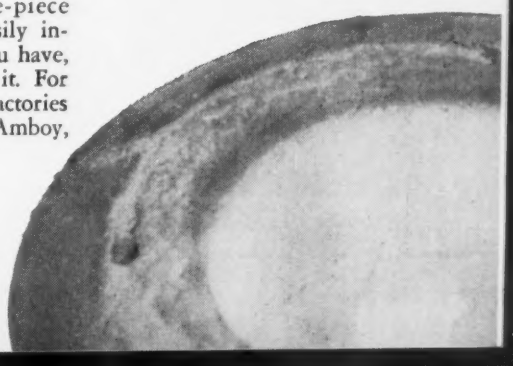
el costs will drop perceptibly. The ALFRAX ment's remarkable insulating properties actually wer the furnace's heat capacity. And because the RBOFRAX liner can be made thinner than other ractories, it leaves more space for insulation.

u can raise production. Thanks to the ALFRAX ment, melts are faster and melting time is con- ent. Moreover, the CARBOFRAX lining will take 00°F and above without softening. You can sh your furnace harder to meet exacting melt- g schedules.

You'll do a lot less patching. CARBOFRAX linings are outstandingly resistant to flame erosion, spalling and cracking. It will be a long time before they will need even minor attention.

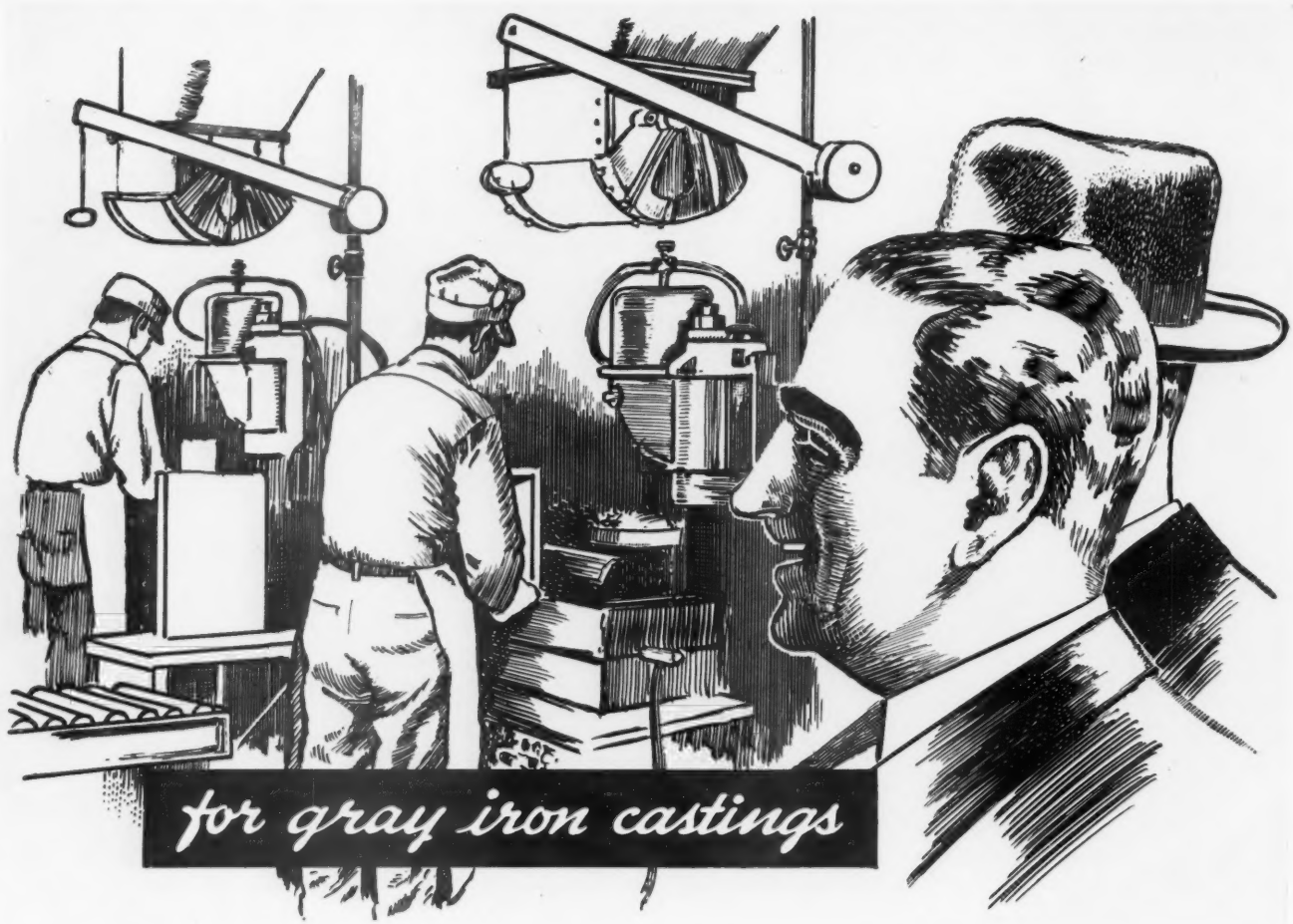
For smaller-diameter furnaces, one-piece CARBOFRAX rings are easily handled, easily installed. But no matter what size furnace you have, CARBORUNDUM can supply a lining for it. For full information, write Dept. A115, Refractories Division, The Carborundum Co., Perth Amboy, New Jersey.





CARBORUNDUM

Registered Trade Mark



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TRADE MARK REGISTERED

The UNIVERSAL FOUNDRY SAND

JUNIATA Bank Sand, the universal foundry sand, has a natural priming coat which readily takes clay bond and mixes easily. It permits hard ramming, produces sharper profiles and makes an ideal facing sand base.

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JUNIATA Bank Sand is available either raw or artificially dried in several grades ranging from AFS 85—110.

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UNITED ARTISTS BUILDING, DETROIT, MICHIGAN

Redmond, Buckeye Foundry Co., Cincinnati, who is president, Miami Valley Foundrymen's Association, and George Grosser, secretary, Manufacturers Industrial Relations Association, Kalamazoo, Mich.

Principal arguments by these two speakers in favor of group bargaining are that 1) small companies frequently do not have the personnel capable of handling negotiations, 2) the practice permits all foundries to be represented by the best qualified men, 3) the most nearly complete information is made available to the negotiators, and 4) the plan prevents playing one company against another. Mr. Grosser's organization, he said, has served 64 years without a strike. Labor negotiations are handled by six representatives each of member companies and the unions, with decisions binding on all the companies.

Speaking for negotiations by individual companies were A. V. Martens, Pekin Foundry & Mfg. Co., Pekin, Ill., R. R. Washburn, Plainville Casting Co., Plainville, Conn., and William G. Raven, Continental Motors Corp., Detroit. These panelists contended that special conditions might handicap an individual plant in being bound to results of group negotiations. Also that industry-wide bargaining is regarded as unhealthy and group bargaining is a step in that direction. They likewise believe that individual bargaining establishes a better relationship with employees. Moreover, it was felt that group bargaining tends to stifle competition through establishment of uniform wage rates.

Panel Discusses Role of Foremen

Another panel discussion, on "The Role of the Foreman in the Foundry," had J. P. McGury of NFA as moderator and these speakers: A. G. Hall, Nordberg Mfg. Co., Milwaukee; W. E. Jones, Josam Products Co., Michigan City, Ind.; J. D. McGill, United States Pipe & Foundry Co. Birmingham; C. A. Carolin, R. B. Carolin Foundry & Machine Co., Detroit.

Qualifications of a good foreman, Mr. Hall said, are these: Technical know-how; an appreciation of the problems of other departments at his level; ability to operate as a member of the management team; ability to develop a harmonious organization and a smoothly working team. Mr. Hall recommended that the foundry have candidates for foremanship coming along rather than postponing training until a vacancy exists.

Various of the panelists emphasized the importance of looking for leadership characteristics in men considered for these positions; such

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Maximum Wearing Comfort

• The soft, moulded rubber facepiece of the CESCO No. 602 mask makes a comfortable, leak-proof fit. Once head harness is adjusted to fit, mask can be slipped off and on without readjustment. Flexible lead-in hose allows free movement of head.

Uses—The CESCO No. 602 mask with Duratex hood gives complete protection against sand, shot, and grit in foundries, steel mills, and refineries. Its utility adapts it for use in shops doing sand blasting and metallizing. Workers produce more when equipped with a CESCO No. 602.

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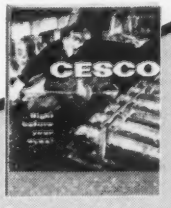

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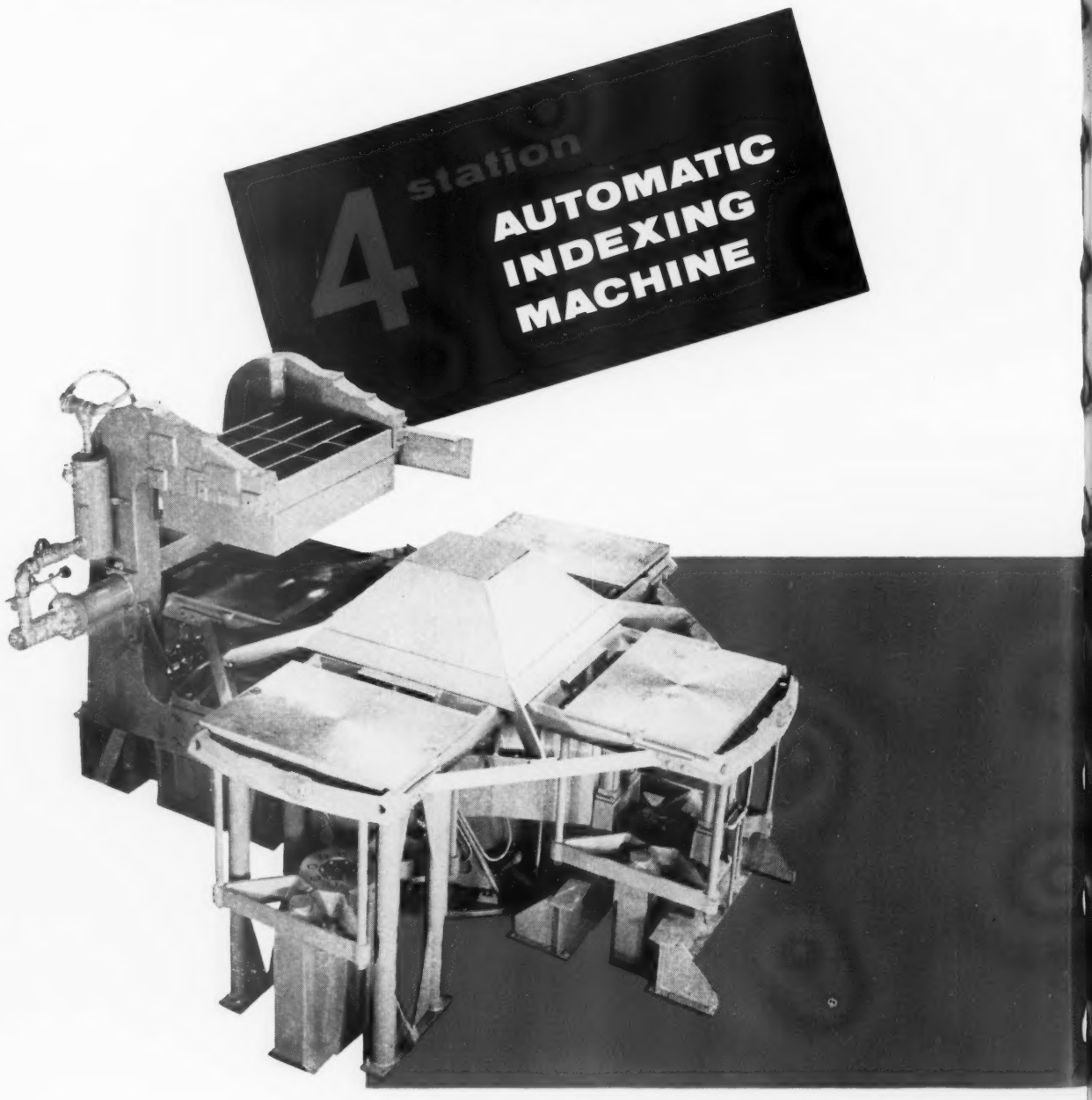

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Stationmasters are built to produce flask sizes from 20 x 24" to 42 x 48". An adjustable bunter control valve insures proper jolt. Squeeze pressures are adjustable to a maximum, and the squeeze piston has a limit stop. Strike-off bar is adjustable. Automatic indexing with adequate registrations assures accurate location of flasks at all positions. The Stationmaster can be completely automatic or semi-automatic.

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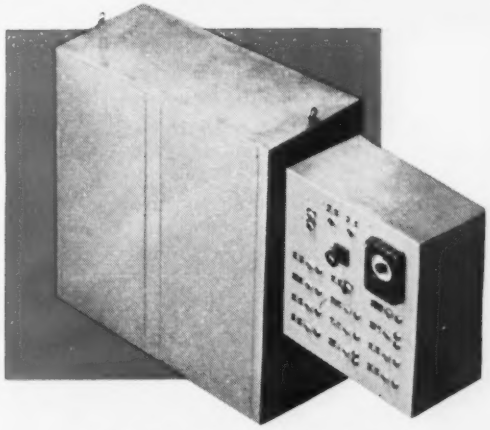
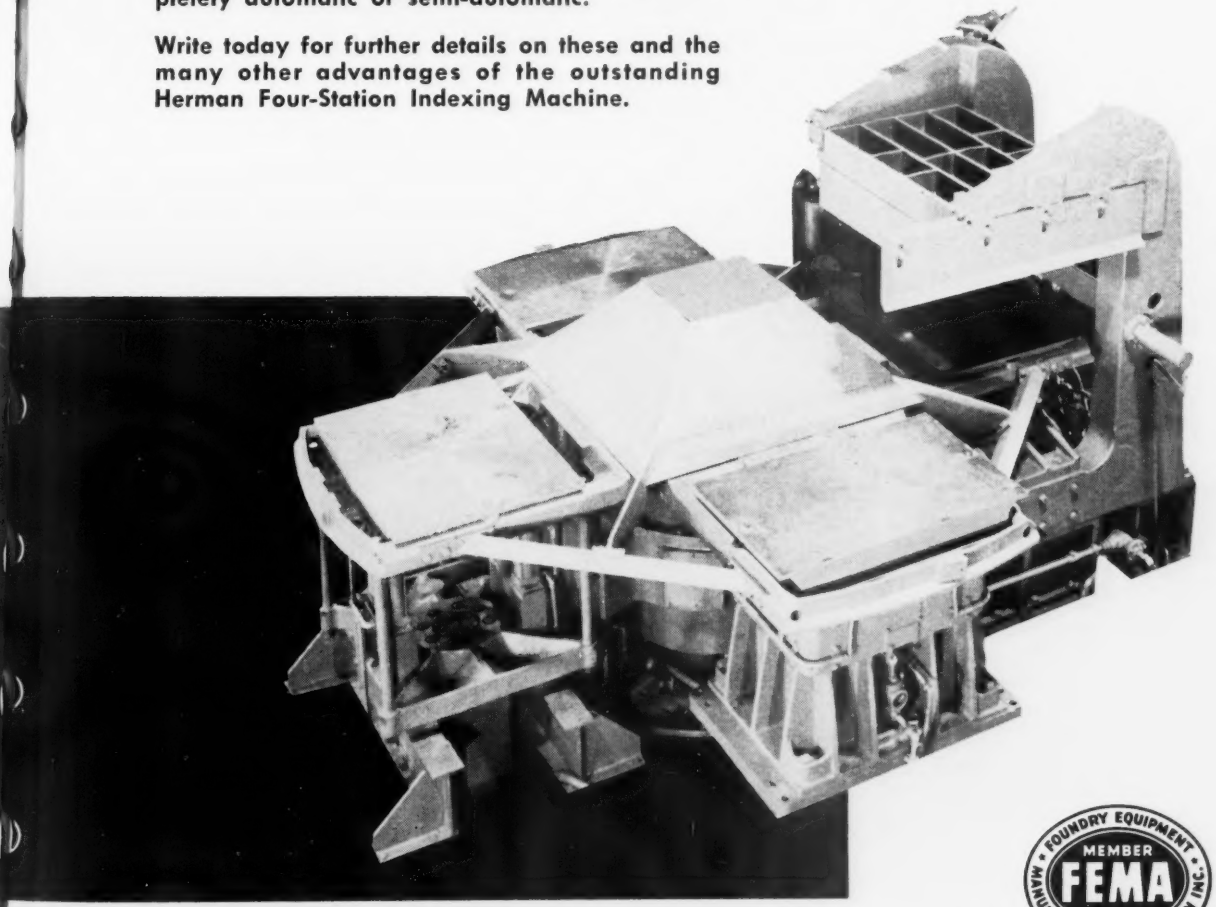


Note the simplified, compact automatic or semi-automatic controls.



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men should be human engineers as well as technicians. At the same time management should delegate to the foreman authority as well as responsibility and should keep him thoroughly informed on company policies and on problems of other departments of the plant. As pointed out by one speaker, too many employees get information regarding company policies from unreliable sources, whereas they should get the best picture through their foreman, who should reflect the feelings of the company itself.

A concluding panel session covered "The Effect of GAW (or SUB) Settlements on the Foundry Industry." Panelists were Karlton W. Pierce, Ford Motor Co., Dearborn, Mich.; Floyd Lawrence, Detroit editor, *Steel;* Robert L. Schutt, City National Bank & Trust Co., Chicago; Joseph Daoust, Morss, Seal & Daoust, Detroit; James I. Poole, Fairchild, Foley & Sammond, Milwaukee.

Mr. Pierce described features of the supplementary unemployment benefit plan instituted recently by Ford. He explained that benefits will be paid only when the worker has qualified for state unemployment payments and that since benefits are short of full-time pay, the plan is designed to induce workers to seek other jobs when laid off. The plan, he indicated, will have no major influence on the company's choice between producing a part or buying it from outside suppliers. Other factors were said to offer much more of an incentive to stabilize employment than does SUB.

Mr. Lawrence pointed out that SUB is not a guaranteed annual wage, since the company's liability to make payments is limited by the agreed-upon maximum size of the pool being accumulated from which benefits will be paid. Actually, he added, it is merely an extension of the already established unemployment compensation plan to which industry regularly contributes.

Cites Cost of Fringe Benefits

The cost of fringe benefits granted by larger companies actually is much less than the publicized figures, it was stated by Mr. Daoust. Consequently, he warned, suppliers granting straight hourly increases based on these figures are raising their costs more than are their customers.

A disadvantage of SUB, according to Mr. Poole, is that the high-seniority or highly skilled worker has little chance to benefit from it, because such men will be the last ones to be laid off. Mr. Poole suggested substitution of a plan in which contributions to a fund are based on company profits. A credit would be placed to each individual's account which could be withdrawn not only during lay-offs, but also for reasons of sickness, retirement or death. In contrast, the SUB pool benefits the worker only when he is idled.

Luncheon sessions were held on the two days of the meeting. Speaker at the Thursday luncheon was Alice Widener, publisher and editor of *U.S.A.*, New York, who discussed "Behind the U.N. Front." Mrs. Widener presented considerable factual information concerning moves by the economic commissions of the United Nations which are a direct threat to American free enterprise. Dr. Houston Cole, president, Alabama State Teachers College, Jacksonville, Ala., speaker at the Friday luncheon, commented on the gap between management's plans and management's action in the area of human relations.

The NFA Alumni Dinner, held the evening before the annual meeting, was the occasion for honoring Mr. Ball with presentation of a plaque for his outstanding service as president the past year. In addition, plaques were presented to companies

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Corn Belt Chapter of AFS Sponsors Casting Clinic

Corn Belt Chapter of the AFS again is sponsoring a casting clinic for the benefit of all foundrymen in Nebraska, Iowa, Missouri, Colorado and adjoining territory, with the AFS technical department co-operating.

The one-day meeting is scheduled for Monday, Nov. 14, at the Rome Hotel, Omaha, Neb. Purpose is to assist operating foundrymen and metallurgists to solve technical problems by bringing them information for the production of better castings.

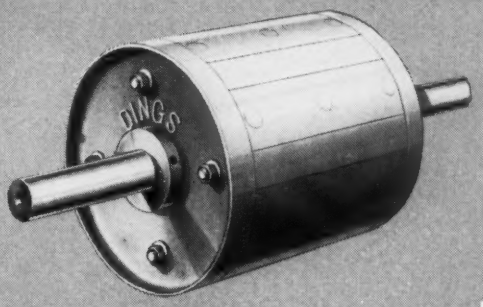
The program will consist of a short course in "Means Toward Better Castings" under the direction of Hans J. Heine, AFS technical director, with the assistance of Lou Pedicini, foundry supervisor, Process Development Section, General Motors.

The society will provide text and reference material for further study of the subjects presented. There will be no registration fee, and the number of representatives each foundry may send is not limited. AFS membership is not a prerequisite. Persons interested in attending are asked to write to James Brinn, secretary-treasurer, Corn Belt Chapter, 2636 Sewell St., Lincoln, Neb.

Program details follow:

New Horizons for the Foundry Industry
(Hans J. Heine)

9 to 9:50 a.m.—*New Horizons in Foundry Progress*
1. Vacuum Degassing
2. Core Shooting
3. Effective Use of Materials
4. Shell Molding



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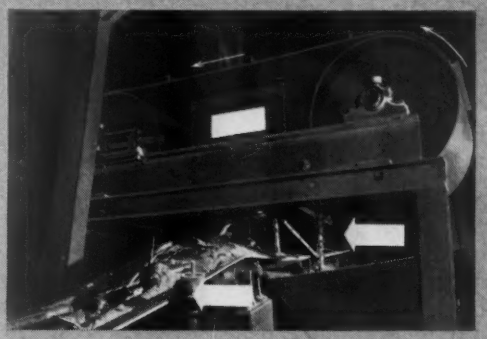

Dings Extra Powerful Self Cleaning Rectangular.

1. 2. 3. 4.

Dings All-Welded Cooler Operating Lifting Magnet.

Dings "Holdtite" holds castings in position for swing grinding.

4 WAYS TO CUT HANDLING COSTS

Compare the advantages these Dings magnets offer over your present methods:

1. THE NON-ELECTRIC, PERMANENT PERMA-PULLEY in the sand handling system takes iron out automatically, without attention, without electricity, without maintenance. Perma-Pulleys have no operating expense, are guaranteed to be permanently magnetic. Magnetic strength is certified.

2. THE SELF CLEANING RECTANGULAR FOR THE TOUGHEST JOBS . . . *another sand handling cost-cutter.* Great power enables this magnet to handle particularly difficult iron extraction jobs. For *maximum* iron removal, none can surpass the Dings Rectangular. Self-cleaning feature makes operation automatic—eliminates "carry-over" of sand with iron.

3. LIFTING MAGNET LIFTS 10 TO 100% MORE. Ideal for handling scrap, pig iron, castings, metal flasks, etc. Lifts more because it's cooler operating. All welded, lightweight, moisture-proof, rugged, 4-point chain suspension.

4. "HOLD-TITE" CUTS GRINDING LABOR COSTS UP TO 25%. Firmly holds all shapes of castings up to 1000 lbs. in position for swing grinding. Magnet can be tilted to 7 different positions. Requires practically no maintenance, simple to install. SEND FOR THIS PAPER: *"Lowering Cleaning Room Costs Through Use of Magnetic Chucks".* Use coupon below.

If you can use the advantages these magnets offer, NOW is the time to act. Deliveries are still better than average.

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Article on "Lowering cleaning room costs through the use of magnetic chucks"

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Production line of Logan Roller Conveyor permits continuous pouring in this modern steel foundry. Molds are received from spur storage lines. After pouring, they are delivered through cooling to shake-out and on to further processing.

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10 to 10:50 a.m.—*Principles of Vertical Gating*
1. Fundamentals of Good Gating Design
2. AFS colored sound-motion picture, "Effect of Vertical Gating Design on Casting Quality"
3. Discussion

11 a.m. to 12 noon—*The Carbon Dioxide Process*
1. Fundamentals of the CO_2 Process for Cores and Molds
2. AFS motion picture on application
3. Demonstration and discussion

Principles of Molding Sand Technology (Lou Pedicini and Hans J. Heine)

12:15 to 1:30 p.m.—*Noon Recess* (luncheon place and speaker to be announced)
1:45 to 2:20 p.m.—*Components of Molding Sands*
2:30 to 3:10 p.m.—*Properties of Molding Sands*
3:15 to 3:50 p.m.—*Core Sand Practice*
4 to 5 p.m.—*Discussion* (including questions)

Michigan Regional Conference Is in East Lansing, Dec. 1-2

About 400 people are expected to attend the Michigan Regional Foundry Conference to be held Dec. 1-2 at Kellogg Center, on the campus of Michigan State University, East Lansing, Mich. The conference is sponsored by the Central Michigan, Detroit, Saginaw Valley and Western Michigan Chapters of the AFS in conjunction with the student chapters at Michigan State and University of Michigan.

John A. Van Haver, Sealed Power Corp., Muskegon, Mich., is general conference chairman. Jess Toth, Harry W. Dietert Co., Detroit, is executive secretary. Fred Strieter, Dow Chemical Co., Midland, Mich., is program committee chairman. Robert Dodge and Paul Olson are student activity chairmen.

Program details follow:

Thursday, Dec. 1

9 a.m.—Registration
9:45 a.m.—Introduction and welcoming address: Prof. L. C. Price, Michigan State University.
10 a.m.—Keynote Address: **"Morale—The Key to Productivity,"** John Schneider, Ford Motor Co., Dearborn, Mich.
11 a.m.—**"The CO_2 Process,"** Hans J. Heine, technical director, AFS, Chicago.
12:15 p.m.—Luncheon: Address by Dr. W. W. Whitehouse, introduced by Collins Carter, Albion Malleable Iron Co., Albion, Mich.
2 p.m.—**"Casting Defect Clinic"**—Panel headed by Harry Gravlin, Claude B. Schneible Co., Detroit.
3:10 p.m.—**"Casting Quality through Process Control,"** by Daniel E. Krause, Gray Iron Institute, Columbus, O.
3:50 p.m.—**"Surface Smoothness and Effect of Process Variables"**—Panel headed by Prof. Charles Sigerfoos, Michigan State University. Panel speakers: Earl E. Woodliff, Foundry Sand Service Engineering Co., Detroit; Dr. J. A. Ridderhoff, Frederic B. Stevens Inc., Detroit; C. E. McQuiston, Advance Foundry Co., Dayton, O.; Dr. D. C. Williams, Ohio State University.
6:30 p.m.—Banquet: Address by Dr. D. B. Varner, Michigan State University, introduced by Prof. Charles Sigerfoos. Master of ceremonies, Harry Gravlin.

Friday, Dec. 2

9 a.m.—**"Blowing Shell Molds and Cores,"** G. A. Conger, C & S Products Co., Highland Park, Mich.
9:45 a.m.—**"Automatic Core Blowing,"** C. W. Hockman and William Yaw, Cadillac Motor Car Division, GMC, Detroit.
10:30 a.m.—**"Diaphragm Molding,"** T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago.
11:15 a.m.—**"Intermediate Strength Iron,"** Prof. Richard Schneidewind, University of Michigan.
12:15 p.m.—Luncheon: Address by Hans Heine, introduced by Herbert F. Scobie, American Foundrymen's Society.
2 p.m.—Student award paper.
2:45 p.m.—Selected foundry movies.

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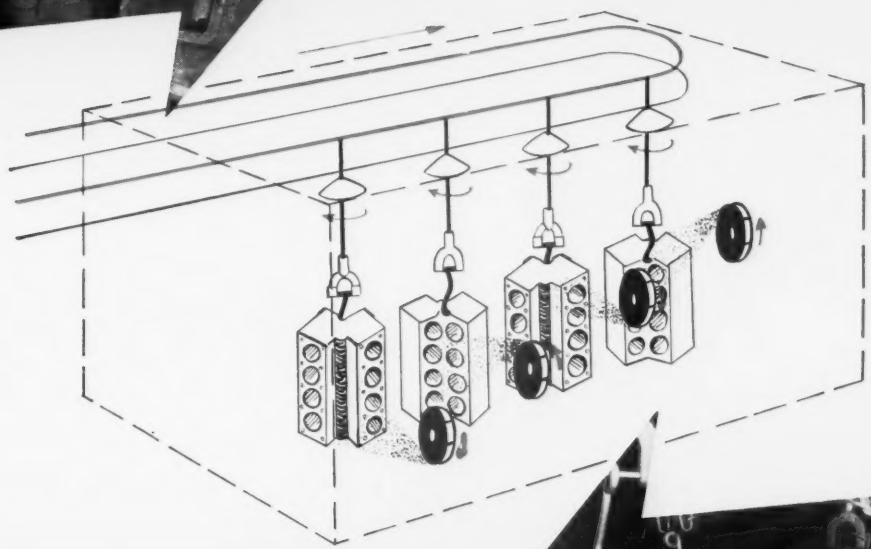
non-stop blast cleaning



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The Wheelabrator Cabinet—a 2 pass, indexing, spinner-hanger type—cleans 10 tons of castings per hour in a steady flow without downtime for loading and unloading. Work hangers of special shapes and types carry a variety of castings, ranging from 5 lbs. to 600 lbs., each, within the blast stream of four Wheelabrator units. The work rotates within the blast of each unit for one minute to thoroughly clean even the most intricate castings.

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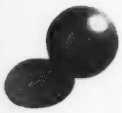
Trail Blazer of Industrial Progress

A NEW PLANT

FOR A NEW 20th Century *persuasive abrasive*



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This modern factory — The Toledo Steel Shot Division — will be devoted to the production of a brand new steel shot, Toledo REALSTEEL — the newest member in our complete line of 20th Century quality shot and grit.

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Foundry Statistics

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1953	970,506	578,749	.....
1954			
July	50,893	25,243	63,711
7 mo.	489,792	265,955	.....
Aug.	59,259	34,528	62,494
Sept.	58,015	33,929	66,742
Oct.	64,321	36,956	71,090
Nov.	70,030	41,609	80,686
Dec.	80,599	49,005	85,064
Total	812,016	461,982	.....
1955			
Jan.	82,028	48,000	99,817
Feb.	85,979	48,721	101,766
Mar.	102,364	60,063	99,730
Apr.	101,226	57,397	104,091
May	98,397	57,317	106,446
June	99,456	60,261	107,559
July	75,570	44,914	115,420
7 mo.	645,020	376,673	.....

ALUMINUM

(Shipments of castings—1000 pounds)

	Shipments—Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1953	658,022	214,553	200,025	239,330	.....
1954					
July	41,131	11,689	13,819	15,038	77,326
7 mo.	358,593	96,272	115,599	139,711	.....
Aug.	43,522	11,642	15,415	15,835	77,304
Sept.	47,844	11,107	16,731	19,344	80,294
Oct.	54,903	12,765	19,238	22,247	88,518
Nov.	56,066	12,934	20,396	22,137	94,491
Dec.	64,045	13,753	23,629	26,017	99,556
Total	624,973	158,473	214,408	245,291	.....
1955					
Jan.	64,414	13,358	23,679	26,819	102,382
Feb.	66,869	13,579	24,319	28,234	108,939
Mar.	78,958	16,019	29,029	33,229	110,046
Apr.	73,049	14,041	28,028	30,208	109,156
May	71,691	14,235	25,597	31,243	104,984
June	68,473	14,920	24,682	27,939	102,799
July	55,033	11,716	21,006	21,656	101,024
7 mo.	478,487	97,868	176,340	199,328	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Sand	Perm. Mold	Unfilled Orders[2]
1953	990,496	888,369	61,316	.....
1954				
July	56,733	51,424	3,073	31,042
7 mo.	485,635	425,139	29,610	.....
Aug.	69,091	63,589	3,547	29,052
Sept.	68,487	62,372	3,637	31,232
Oct.	70,276	63,855	3,619	30,396
Nov.	70,020	63,065	4,089	27,608
Dec.	72,421	65,159	4,346	32,054
Total	835,930	753,179	48,848	.....
1955				
Jan	72,233	64,540	4,678	30,864
Feb.	75,253	67,768	4,598	37,520
Mar.	92,149	83,149	5,619	42,940
Apr.	84,183	75,903	5,152	51,111
May	85,008	76,064	5,513	49,198
June	90,476	80,869	5,840	45,820
July	65,816	59,138	3,998	48,085
7 mo.	565,118	507,431	54,588	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1953	34,517	31,469	.....
1954			
July	1,954	1,742	8,098
7 mo.	14,952	13,269	.....
Aug.	2,190	1,977	7,821
Sept.	2,095	1,891	7,499
Oct.	2,092	1,876	7,294
Nov.	2,161	1,906	6,867
Dec.	2,287	1,906	6,678
Total	25,777	22,950	.....
1955			
Jan.	2,305	2,067	7,236
Feb.	2,160	2,009	7,376
Mar.	2,572	2,311	7,011
Apr.	2,633	2,405	6,800
May	2,399	2,174	6,530
June	2,367	2,098	6,346
July	1,920	1,763	5,912
7 mo.	16,356	14,827	.....

PRODUCTION WORKERS

Estimated Number

(Thousands)

	June 1955	May 1955	June 1954
Ferrous	212,700	209,900	185,500
Nonferrous	71,400	71,000	60,000

Average Weekly Earnings

Gray Iron	82.54	85.77	73.30
Malleable Iron	85.00	87.47	71.25
Steel	87.78	86.74	74.45
Nonferrous	84.25	85.07	79.19

Average Weekly Hours

Gray Iron	41.9	43.1	39.2
Malleable Iron	42.5	43.3	37.7
Steel	41.8	41.7	37.6
Nonferrous	40.7	40.9	39.4

Labor Turnover Rate (June)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	4.8	4.0	2.3	0.8
Malleable Iron	3.9	3.6	2.5	0.1
Steel	4.7	2.7	1.6	0.4
Nonferrous	4.3	4.3	1.5	2.0

Source: Bureau of Labor Statistics

GRAY IRON CASTINGS—SHIPMENTS (Net Tons[1])

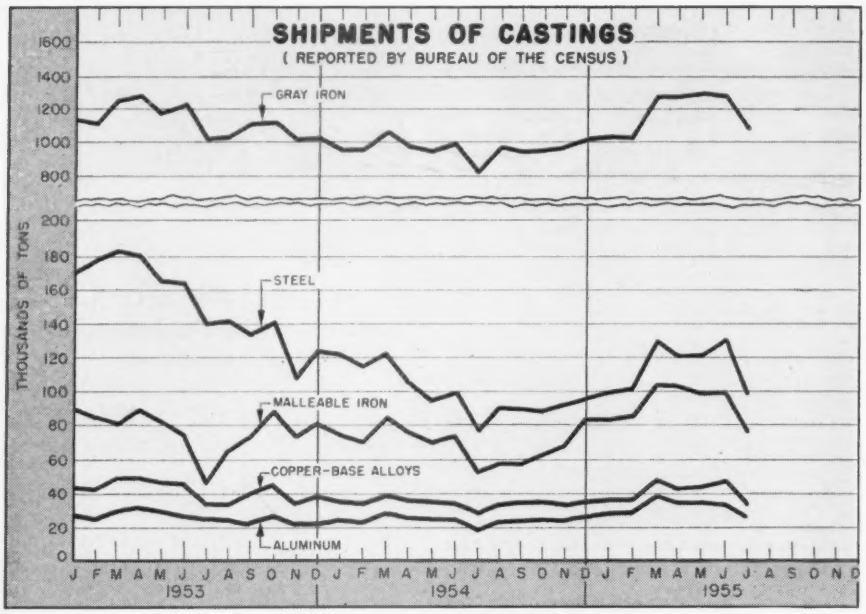
	All Castings—Total	All Castings—For Sale	Miscellaneous Castings—Total	Miscellaneous Castings—For Sale	Heavy Steel Ingot Molds—Total	Heavy Steel Ingot Molds—For Sale	Chilled Railroad Car Wheels—Total	Pressure Pipe & Fittings—Total[3]	Soil Pipe & Fittings—Total[3]	Unfilled Orders[2]
1953	13,707,902	7,494,843	8,449,837	3,675,454	2,829,159	1,389,483	467,142	1,285,598	677,166	.....
1954										
July	821,151	449,621	510,173	209,294	131,180	62,681	22,902	98,810	59,086	828,924
7 mo.	6,661,786	3,584,008	4,288,113	1,777,280	986,472	443,119	204,800	764,707	454,707	.....
Aug.	934,644	541,904	569,790	250,702	140,165	69,897	29,134	127,255	68,300	829,505
Sept.	921,232	533,909	559,934	248,124	139,679	68,053	25,374	124,821	71,424	810,654
Oct.	942,934	552,022	570,365	253,802	150,282	79,191	23,599	130,326	68,362	789,117
Nov.	997,301	547,447	623,390	258,933	167,983	85,703	25,723	118,480	61,725	759,613
Dec.	1,074,258	563,699	680,700	276,045	200,044	97,936	27,229	111,082	55,203	744,633
Total	11,532,158	6,322,989	7,292,292	3,064,886	1,784,625	843,899	325,859	1,376,671	743,721	.....
1955										
Jan.	1,091,923	563,153	712,097	282,386	192,132	97,007	25,783	100,638	61,273	782,656
Feb.	1,106,165	578,171	720,304	291,675	196,118	99,794	27,401	95,285	67,057	852,168
Mar.	1,314,918	688,733	847,874	334,287	217,571	109,681	36,732	129,746	82,995	934,224
Apr.	1,293,678	679,867	819,872	319,149	216,116	108,490	35,415	145,871	76,404	966,057
May	1,310,424	707,105	803,897	315,072	227,236	117,915	35,966	168,772	74,553	937,949
June	1,296,196	715,862	793,067	327,520	228,044	117,727	43,807	147,351	83,927	981,918
July	1,069,711	579,122	634,869	246,297	210,130	112,137	28,181	129,191	67,340	1,049,565
7 mo.	8,483,015	4,512,013	5,331,980	2,116,386	1,487,347	762,751	233,285	916,854	513,592	.....

STEEL CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings—Total	All Castings—For Sale	All Castings—Railway Specialties	Carbon—Total	Carbon—For Sale	Carbon—Railway Specialties	Alloy—Total	Alloy—For Sale	Alloy—Railway Specialties	Unfilled Orders[2]
1953	1,834,197	1,400,013	321,010	1,276,729	959,493	293,491	557,468	417,148	27,519	.....
1954										
July	75,848	53,207	5,815	50,453	33,461	4,964	25,395	19,746	851	170,567
7 mo.	737,856	549,985	88,758	506,709	368,914	79,782	231,147	181,815	9,794	.....
Aug.	89,590	66,792	9,844	61,344	44,236	8,148	28,256	22,556	1,196	168,303
Sept.	88,359	64,722	8,668	59,039	41,735	7,690	29,320	22,987	978	158,823
Oct.	87,085	64,004	8,580	56,705	39,872	7,596	30,380	24,132	984	154,079
Nov.	87,659	64,812	7,742	56,057	40,085	6,624	31,602	24,727	1,118	175,715
Dec.	93,547	69,843	12,489	62,967	45,632	10,469	30,841	24,211	1,245	179,148
Total	1,184,096	880,158	135,581	802,321	580,474	120,309	381,285	303,428	15,315	.....
1955										
Jan.	98,238	75,044	13,809	67,307	49,816	12,762	30,841	25,228	1,047	201,839
Feb.	106,430	80,729	16,501	74,709	55,014	15,381	38,945	25,715	1,120	202,301
Mar.	127,460	98,926	19,339	88,867	68,013	17,887	34,933	30,913	1,452	215,059
Apr.	120,053	92,237	16,646	84,247	63,244	15,163	35,806	28,993	1,483	221,336
May	122,465	92,713	16,810	85,950	63,182	15,335	36,515	29,531	1,475	225,302
June	133,887	102,457	19,591	93,417	69,986	17,979	40,470	32,471	1,612	251,416
July	97,875	71,170	11,631	68,004	48,140	10,666	29,781	23,030	965	354,628
7 mo.	806,408	613,276	114,327	562,681	417,395	105,173	247,291	195,881	9,154	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.

FOUNDRY STATISTICS



COMMERCIAL HEAT TREATING

(National Billings of Metal Institute Members)

	1953		1954		1955	
	No. Reporting	Total Reported	No. Reporting	Total Reported	No. Reporting	Total Reported
May	56	$2,819,628	62	$1,871,175	62	$2,516,300
June	51	2,591,154	61	1,996,770	62	2,488,800
July	58	2,522,651	61	1,722,499	63	2,035,100
Aug.	60	2,452,186	62	1,801,659	64	2,439,300
8 mo.		21,742,818		16,408,069		18,638,880
Annual total		31,733,067		24,244,368		.....

COKE PRODUCTION AND CONSUMPTION

(Net tons)

	Production	Consumption Total	Consumption By Foundries
1953	78,467,806	78,227,414	2,915,420
1954			
July	4,618,665	4,555,701	170,617
7 mo.	34,602,342	34,203,753	1,446,062
Aug.	4,510,603	4,501,477	195,344
Sept.	4,490,603	4,434,650	191,607
Oct.	5,082,374	5,100,135	208,418
Nov.	5,230,237	5,283,916	221,391
Dec.	5,610,564	5,615,228	217,104
Total	59,526,723	59,139,159	2,479,926
1955			
Jan.	5,805,926	5,862,113	234,784
Feb.	5,394,166	5,519,241	242,282
Mar.	6,235,909	6,306,723	286,072
Apr.	6,135,645	6,164,459	278,242
May	6,426,747	6,570,567	277,967
June	6,148,026	6,297,338	249,525
July	6,169,770	6,266,631	221,372
7 mo.	42,316,189	42,987,072	1,790,244

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1954	1955
Jan.	20,661	25,201
Feb.	19,920	25,349
Mar.	23,653	29,713
Apr.	24,746	27,641
May	22,269	23,708
June	22,348	23,141
July	17,074	18,513
Aug.	21,684	27,013
Sept.	22,464	.....
Oct.	24,080	.....
Nov.	23,061	.....
Dec.	21,273	.....
Total for year	263,233	.....

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1953	521,253	349,022	.....
1954			
July	31,710	18,605	43,231
7 mo.	294,833	174,576	.....
Aug.	38,093	24,897	46,288
Sept.	38,973	25,617	56,206
Oct.	42,202	27,337	64,700
Nov.	51,990	35,207	62,950
Dec.	54,410	35,211	69,603
Total	520,501	322,845	.....
1955			
Jan.	58,586	35,472	70,691
Feb.	58,585	35,893	73,858
Mar.	71,811	44,048	81,363
Apr.	71,595	45,477	81,756
May	63,735	38,124	74,472
June	66,569	42,753	71,344
July	47,928	27,429	68,927
7 mo.	438,809	269,196	.....

INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1954	1955
Jan.	173.8	81.0
Feb.	99.9	90.4
Mar.	82.7	163.6
Apr.	125.3	178.6
May	80.8	145.7
June	86.4	186.8
July	68.8	213.4
Aug.	75.6	....
Sept.	68.3	....
Oct.	147.5	....
Nov.	61.4	....
Dec.	113.9	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent (monthly average). This is a new base period. Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	By Types of Furnace: Cupola Total	Air Total	Electric Total
1953	69,005,976	9,676,463	1,026,334	8,263,880
1954				
June	4,664,561	725,910	75,306	515,019
6 mo.	27,621,323	4,384,234	442,659	3,024,982
July	3,909,336	565,275	45,920	420,564
Aug.	4,164,703	671,631	65,336	486,596
Sept.	4,298,495	675,593	68,860	500,349
Oct.	4,782,488	710,127	67,678	528,432
Nov.	4,928,850	737,286	71,844	573,298
Dec.	5,075,563	798,435	82,910	566,223
Total	54,780,758	8,542,581	855,207	6,100,444
1955				
Jan.	5,416,052	813,682	90,622	614,824
Feb.	5,350,452	823,465	91,916	577,296
Mar.	6,313,717	993,266	113,198	727,401
Apr.	6,239,036	975,751	108,965	726,138
May	6,415,947	963,082	109,074	745,060
June	6,117,573	928,908	116,419	733,573
6 mo.	35,852,777	5,498,154	630,194	4,124,292

PIG IRON PRODUCTION AND CONSUMPTION

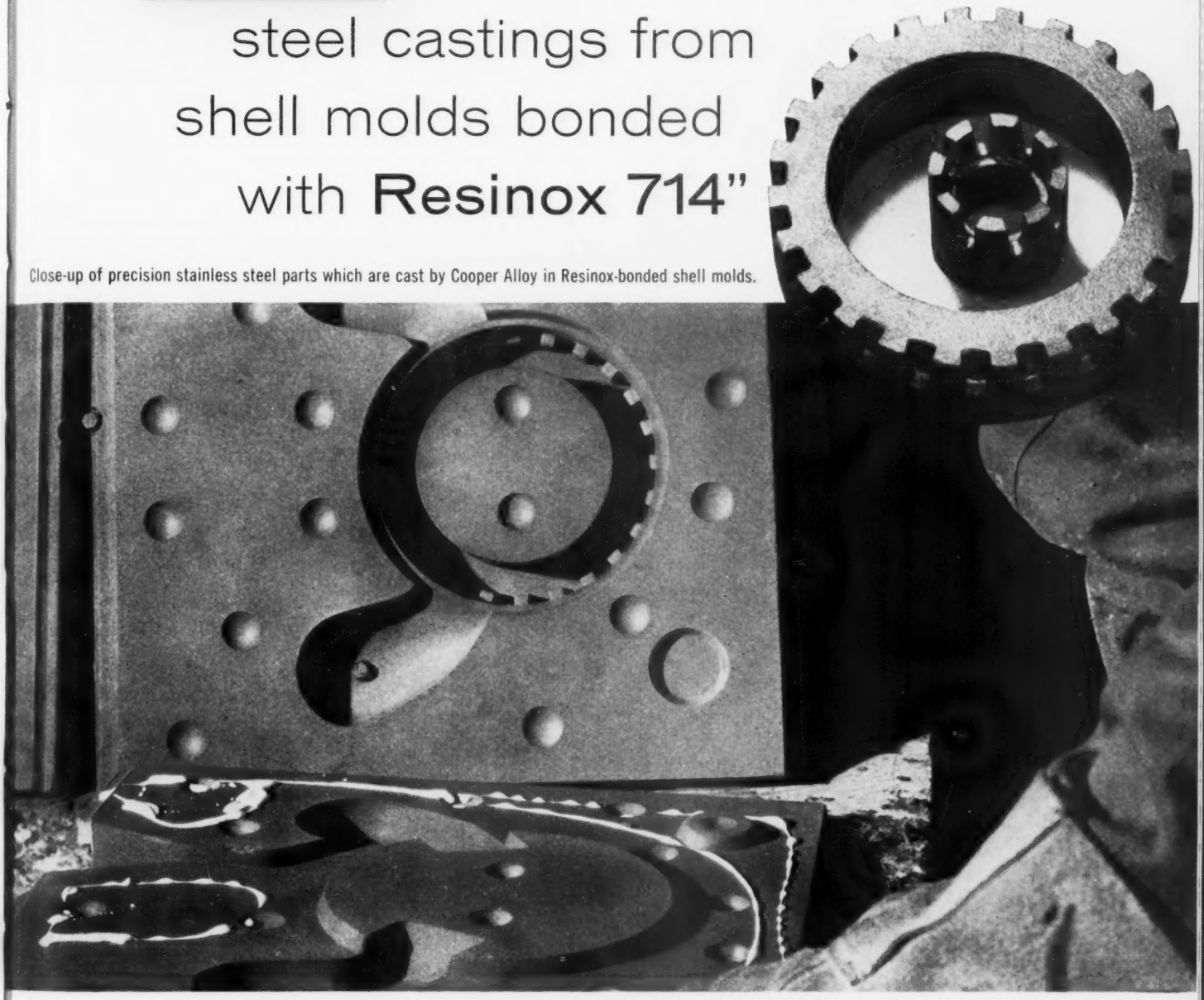
	Production** (standard grades—net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace—gross tons) Total	Cupola	Air	Electric
1953	74,879,511	2,599,307	3,736,431	60,465,016	8,347,825	66,637,364	4,918,480	272,311	164,267
1954									
Aug.	4,529,291	186,097	165,891	3,722,094	455,209	4,013,552	354,067	15,926	10,325
8 mo.	38,027,434	1,408,059	1,847,467	31,138,786	3,633,122	34,106,778	2,871,405	145,981	102,448
Sept.	4,417,888	188,599	179,629	3,622,799	426,861	4,005,578	346,698	16,984	11,654
Oct.	4,937,436	212,237	248,643	3,979,437	497,119	4,518,770	367,063	16,186	11,307
Nov.	5,204,446	202,824	263,484	4,233,253	504,885	4,764,215	375,526	16,178	15,932
Dec.	5,526,720	229,717	259,423	4,510,772	526,808	4,978,200	403,726	19,829	13,917
Total	58,113,924	2,241,436	2,798,646	47,485,047	5,587,465	52,373,541	4,364,418	215,158	155,258
1955									
Jan.	5,729,404	243,608	272,451	4,703,875	509,470	5,202,360	409,281	18,874	20,016
Feb.	5,394,585	209,852	252,860	4,425,080	506,793	4,964,515	409,141	20,576	22,551
Mar.	6,406,902	221,437	359,413	5,239,116	586,936	5,830,943	480,639	24,066	15,931
Apr.	6,329,927	210 085	305,188	5,068,506	746,148	5,725,258	467,709	21,536	12,857
May	6,753,236	246,661	342,544	5,385,299	788,732	6,044,882	471,657	21,448	20,085
June	6,494,838	238,412	347,631	5,245,861	662,934	5,774,896	454,751	22,871	21,697
July	6,329,393	233,235	344,365	5,116,960	634,833	.....	.....	.....	.....
Aug.	6,529,580	251,459	319,951	5,214,901	743,269	.....	.....	.....	.....
8 mo.	49,967,865	1,854,749	2,544,403	40,399,598	5,169,115	.....	.....	.....	.....

*Source: U. S. Dept. of Interior. Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

MONSANTO PROFIT PICTURES

"Cleaner stainless steel castings from shell molds bonded with **Resinox 714**"

Close-up of precision stainless steel parts which are cast by Cooper Alloy in Resinox-bonded shell molds.



Note the remarkable smoothness of the shell mold bonded with Resinox 714. Need for costly cleaning of castings is minimized.

COOPER ALLOY CORPORATION CUTS PRODUCTION COSTS 30% BY USING MONSANTO'S PHENOLIC RESIN

One of the companies that pioneered improved shell molding techniques for stainless steel castings now reports that Resinox 714 has been giving them top-quality results for more than three years.

Resinox 714 makes it possible to cast with more detail and with minimum machining, according to Seymour B. Donner, general foreman of the Cooper Alloy Corporation, Hillside, N. J.

"We credit this to the low flow viscosity and melting point of Monsanto's phenolic resin. The texture of the molds is the smoothest we have seen. Castings with fine mesh teeth come out absolutely clean. There's no need to file away snags between the teeth or grind off rough edges."

Cooper Alloy has also reduced scrap resulting from blow holes. Resinox 714 has sufficient strength for rigidity but is porous enough to permit escape of air through the body of the mold.

In producing stainless steel parts for Manning, Maxwell & Moore's Maxiflow safety valve (pictured above), Cooper Alloy has been able to lower their production costs 30%.

If excessive machining and finishing requirements are hurting your profit picture, get the full story on Resinox shell molding resins. For a complete line of phenolic or urea foundry resins that are research-developed and shop-tested to meet *your* needs, write first to Monsanto Chemical Company, Plastics Division, Dept. FO-11, Springfield 2, Mass.

For stronger, smoother shell molds, specify

RESINOX®

MONSANTO

CHARLES PACK
. . . winner ADCI award

WILLIAM J. DURING
. . . re-elected president

DIE CASTERS ENJOYING BEST YEAR

. . . Look Ahead to Future Expansion

NEW records this year in production of both aluminum and zinc die castings are indicated by figures for the first half. Consequently, discussions of metal market conditions the remainder of the year and in 1956 were of particular interest to those attending the 27th annual meeting of the American Die Casting Institute, held Sept. 14-15 at the Edgewater Beach Hotel, Chicago.

Current aluminum die casting requirements are running 75 per cent ahead of 1954 and 53 per cent ahead of 1953. Zinc die castings are 54 per cent ahead of last year and 25 per cent above 1953's all-time high for the industry. Sales in 1955 are at a $390-million rate. The steep acceleration of demand for aluminum castings is continuing, and commitments for 1956 point to another sharp jump in consumption.

Biggest gains in consumption of die castings this year have occurred not only in the auto markets, but also for use in appliances, electronic components, business machines and air-conditioning equipment. The institute estimates that metal consumption by the die casting industry this year will reach 325,000 tons of zinc and 185,000 tons of aluminum. Projections for 1957 point to a consumption of 250,000 tons of aluminum.

Metal suppliers indicated that for 1956 the zinc supply should be adequate but implied that aluminum supplies would be tight. There is some hope, it was reported, that the government will limit exports of scrap and curtail the stockpiling program. Die casters get 85 per cent of their aluminum from secondary smelters. It was pointed out at the meeting, however, that production of primary aluminum is expanding rapidly and if secondary aluminum prices continue at their unnaturally high level, more primary metal may go to the die casting industry.

As presently constituted, the ADCI represents nationally custom or job shop die casters who supply about 80 per cent of all die castings produced for sale in this country. Eight new companies recently were admitted to membership. The Institute roster now includes 102 companies operating 112 plants.

At the business meeting, officers for 1954-55 were re-elected to serve in 1955-56. Officers are: William J. During, Precision Castings Co., Syracuse, N. Y., president; George Ralls, Pressure Castings Inc., Cleveland, vice president. David Laine and W. J. Parker of the institute are secretary and treasurer, respectively.

The product standard program, initiated a year ago and aimed to be a service to designers and engineers in avoiding "overspecification," was reviewed. In March, 1955, five engineering standards were released covering linear dimensional tolerances, parting line tolerances, draft requirements for walls, moving die part tolerances and flatness tolerances.

Six additional engineering standards were approved and released covering depth of cored holes, draft requirements for cored holes, cored holes for tapping, ejector pin marks, flash removal and machining stock allowances. A metallurgical series is being prepared for publication and will present alloy cross-reference charts, composition and properties of standard aluminum alloy die castings, composition and properties of special aluminum alloy die castings and characteristics of aluminum alloys.

A series covering "commercial practice and trade customs" also was announced. This series, based on a review of sales practices over the last 25 years, covers the industry custom on escalation clauses, dies and tools, acceptance and delivery detail and other contractual provisions of importance to purchasers.

The institute's certified zinc alloy plan also was discussed. Under this plan a licensing certification is issued to qualified die casters requiring them to submit production-run castings, selected at random, to an unbiased recognized independent laboratory for test. Where production meets the standards for chemical composition, as required by ASTM specifications, that producer can identify his castings with the CZAP symbol.

At the annual banquet, Charles Pack, former vice president, Doehler-Jarvis Division, National Lead Co., was presented with the annual Doehler Award. He was cited for his 44 years of pioneering effort in

Report on the 15 cu. ft. MICHIGAN 12B:

New Tractor Shovel features power-shifting, twenty per cent more weight and power

Heavier and more powerful than comparable machines, and infinitely easier to operate—that's the new MICHIGAN 12B. There's no clutch pedal or engine clutch on the 12B: Clark's power-shift transmission completely eliminates this notorious cause of excessive maintenance and down time. From the cutting edge of the 15 cu. ft. bucket to the flywheel of the 44 or 42 horsepower engine (gas or diesel), the MICHIGAN 12B is simply *more* machine.

20% more weight and power. At 6250 lbs. (6350 lbs. diesel), the 12B is 20% heavier than most machines in its class. With 44 or 42 horsepower, gas or diesel, it is 20% more powerful. This margin of weight and power, plus bucket break-out action, enables the 12B to dig its way into material where other machines merely spin their wheels. The 12B's extra weight, low center of gravity and low-level bucket carry-position contribute to its superior stability: you can handle maximum loads safely and fast within its short turning radius.

Instant power-shifting. Engine torque is multiplied up to 300% by the Clark torque converter—automatic torque build-up as you meet tighter, tougher materials. To shift between High, Low or Reverse, simply push the single power-shift lever to the desired position. Hydraulic power in the constant mesh power-shift transmission makes any shift instantly, even when travelling. There's no clutch pedal, no engine clutch, no gear clash. And as any operator will tell you, *it sure beats riding a heavy clutch all day!*

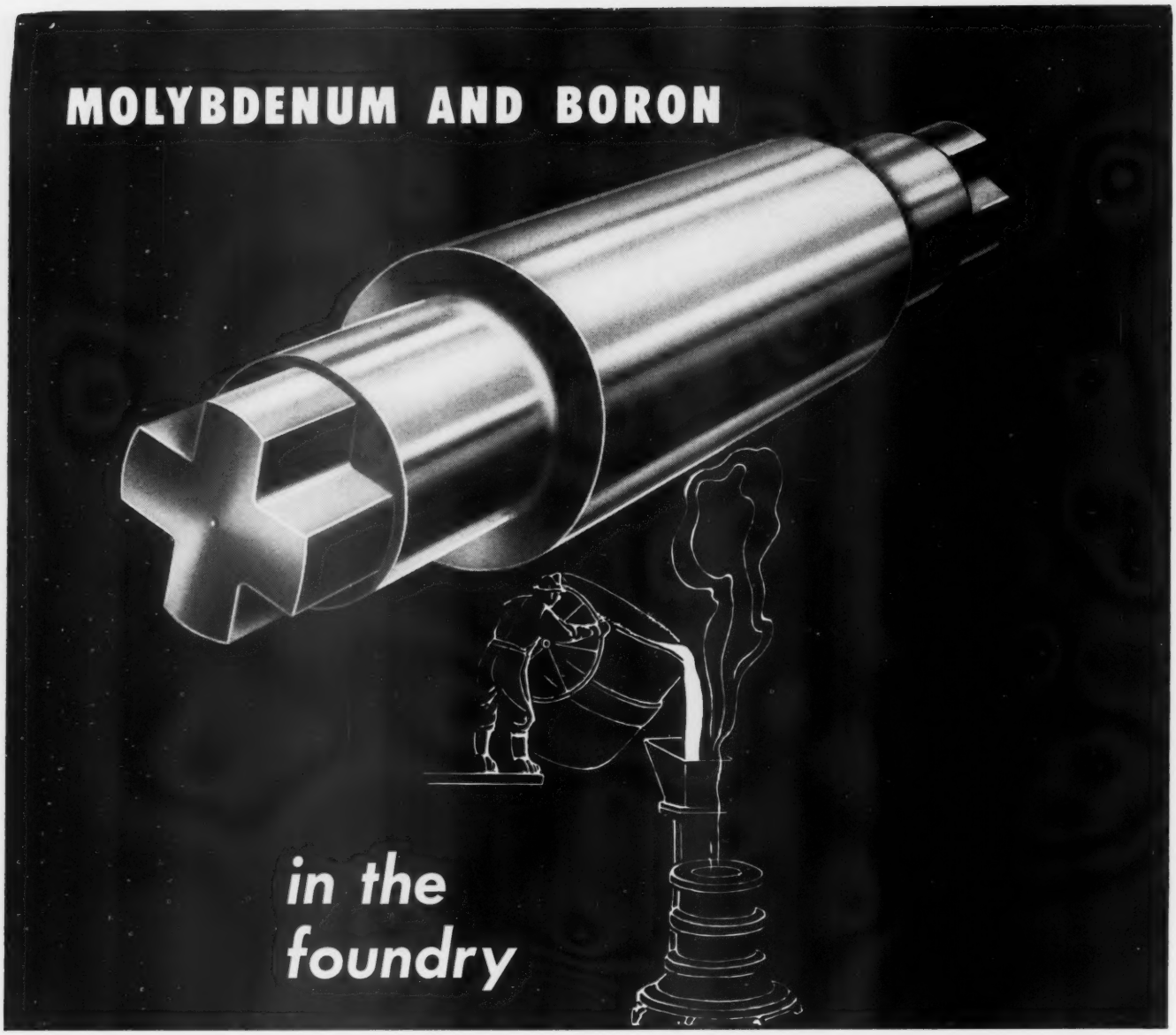
Complete dust protection. The 12B is protected against dust and dirt in every conceivable way. An oil bath air cleaner filters the air which enters the main hydraulic reservoir. There is a filter for the torque converter oil and the power-shift transmission oil. A partial flow filter protects the engine lube oil. Transmission, torque converter, starting motor and generator are all dust-sealed. On the 12B, every precaution has been taken to avoid dust problems.

Make your own comparison. Neither words nor specifications can indicate the working superiority of the new MICHIGAN 12B. You've got to see it in action—see it handling your toughest job. Call your local MICHIGAN distributor or write us direct to arrange an on-the-job demonstration. The new 12B is available on a low cost, no-down-payment Lease Plan—ask for details. Whether you lease or buy the 12B, it will pay for itself faster than any Tractor Shovel you've ever seen. See it!

MICHIGAN is a trade-mark of Clark Equipment Co.

CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY
Construction Machinery Division
442 Second Street
Benton Harbor 36, Michigan



Rolls are among many cast, wrought iron and steel products that have been improved by Molybdenum and Boron. Very small additions, properly introduced, yield surprising results. MCA Molybdenum additions increase the resistance of rolls to breakage, chipping, heat checking and spalling in service. Molybdenum and Boron improve toughness and hardness qualities at both room and higher temperatures.

Similarly, Molybdenum and Boron are effective in improving toughness and hardness in both light and heavy iron and steel castings.

As recognized authorities in the application of Molybdenum, Tungsten, Boron, Cerium and its derivatives both as alloys and chemicals, MCA assures confidential and immediate reponse to inquiries.

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Subsidiary: Cleveland Tungsten, Inc., Cleveland *Plants:* Washington, Pa., York, Pa.

MCA

the die casting industry. Mr. Pack addressed the members of the institute, tracing the history of the industry from its early beginnings and drawing attention to the importance of the automobile industry in the development of the process to its present status.

The successful meeting came to a close with announcements from the Die Casting Research Foundation—an organization founded by the ADCI—that encouraging progress in development of improved die materials should allow the economical production of copper-base alloys within the next few years. It was revealed also that improved die lubricants have been developed and are now in the field testing stage.

Production of Refined Copper Is Up During Second Quarter

Business and Defense Services Administration of the United States Department of Commerce has issued the Summer, 1955, number of its quarterly *Copper Industry Report,* which contains a variety of information concerning copper production and consumption.

It reveals that production of refined copper from domestic ores in the second quarter of 1955 was 271,000 tons, the highest quarterly production since World War II, when peak production of 275,000 tons was reached in the second quarter of 1944. United States net imports of copper (imports of refined and unrefined copper less exports of refined copper) were 559,000 tons in 1953 and 370,000 tons in 1954, but only 147,000 tons in the first six months of 1955.

This drop occurred despite the reimposition of export controls on refined copper and copper-base scrap in Oct., 1954. The six-week strike at some mines, smelters and refineries during July and August caused an estimated loss of 85,000 tons in refinery production and 90,000 tons in ore production.

For the fourth quarter of 1955, it is anticipated that supply and consumption demand for copper in the United States will be in rough balance, provided that scheduled deliveries to government accounts are deferred, restrictions are maintained on exports and no more work stoppages occur.

During the first half of 1955, foundries used a total of 448,054 lb of copper. Of this total, 23,470 lb was refined copper, 164,019 lb was scrap and 260,565 lb was in copper-base alloy ingot.

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While we have just about every size and type of chaplet you can think of, there is a *possibility* that we don't have the *exact type* you require. In that case, we can design and develop *just the chaplet* to suit your requirements! We have all sorts of working samples available, and are always ready to ship them in a hurry to those who wish to try them.

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- TAPER DRIVE PLUGS

Crescent FUSETITE CHAPLETS are accurately made of proper analysis materials for the fusing-in process. We have been devising and supplying chaplets since 1889, and our stocks are amazingly ample and varied. We originated Radiator, Shoulder, Double Head and Motor Chaplets, and if necessary, we can originate Special Chaplets for YOU.

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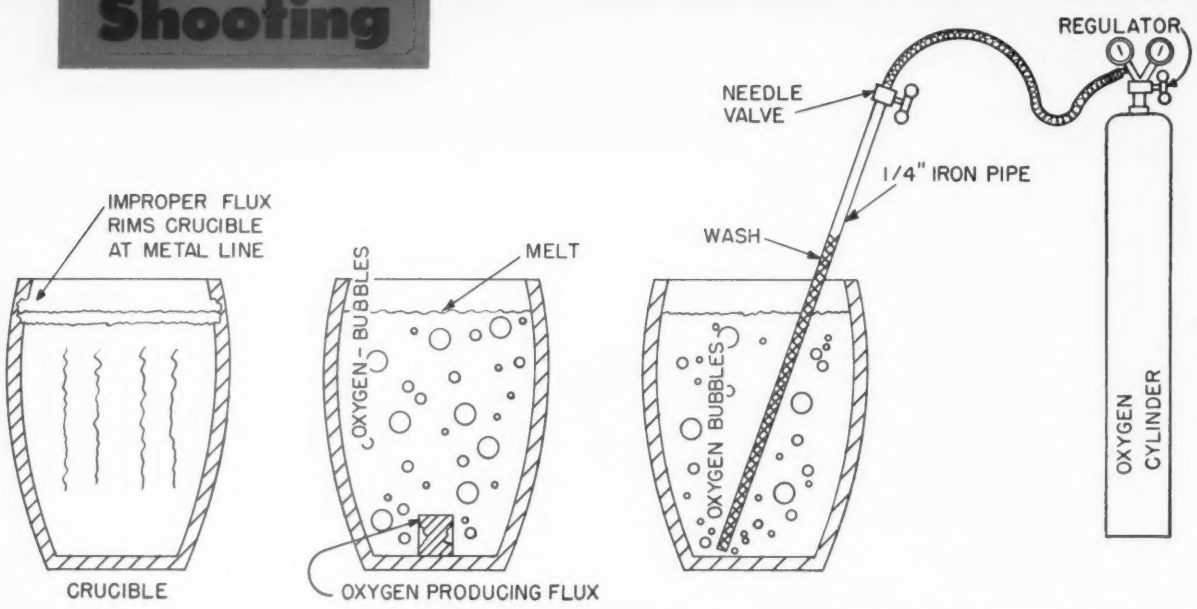
Trouble Shooting

By C. W. AMMEN



Left to right, sketches show how improper flux may attack crucible, how oxygen producing flux bubbles oxygen through melt and how oxygen in cylinder is used

Fluxes, Covers and Oxygen

Dear Charlie:

I have heard there are methods of supplying oxygen to a brass heat while it is melting to insure an oxidizing condition. A vendor assures me that his product will bubble oxygen up through the melt continuously, thus reducing the possibility of hydrogen absorption by the metal. At one time I purchased a flux cover material which ate up the crucibles at the metal line.

So many items are on the market today that they are confusing. No doubt they are all good, but each probably gives a different reaction. I'm none too sharp on chemistry or the mechanics of gassing a heat, and I have read loads of papers on the subject, each a little different.

Can you advise me on this oxygen business and whether it will eat up my crucibles? I understand I actually can introduce oxygen directly into the molten metal to combine with the hydrogen and then de-oxidize later, giving me a good metal. How about that?

Sincerely,
Sam

Dear Sam:

Yes, several very good flux products are on the market for the purpose of giving off oxygen and bubbling it through the liquid metal. For the most part, they are good insurance against the absorption of hydrogen by the melt. The Crucible Manufacturers' Association, the flux manufacturers and your ingot supplier will be only too glad to supply you with advice and information along these lines. These boys have years of practice and research behind them.

The introduction of an oxide material to promote the generation of oxygen in the melt is not new, but has been improved upon by the careful selection and compounding of certain chemicals in the correct proportions to do a particular job. We once used a mixture of copper oxide, sand and borax in the crucible to promote this action. This is the basis of the preference of some old-timers who want rough-topped ingots to get copper oxide in the heat. Smooth-topped ingots are produced to make a better looking product. The ingot maker simply covers the molten top of the ingot with powdered charcoal to exclude oxygen, thus preventing this face from taking an oxide coat.

Although you may have read many articles on the subject which appear to conflict, all are basically the same, but, presented in a different manner. The idea is to limit or exclude the absorption of hydrogen by the melt in sufficient quantity to form an excess of water vapor through combination with oxygen. Sometimes you will observe at the last minute that a sprue which was taking a normal shrink spits and starts to puff up. This condition results from a buildup of hydrogen in the remaining liquid metal as the casting solidifies. This hydrogen unites with oxygen to form steam in greater quantity than can be held in solid solution as the metal solidifies. So the best answer is to keep the gap between them very wide. The pickup points are many—in metal handling, green ladles, furnace linings, wet tools and the molding sand. So beware.

Some operators prefer to add, prior to pouring the melt, a material which will cause a flushing action as a means of supplying a mechanical vehicle for hydrogen and other undesirable elements to ride out on (like a small piece of soda ash placed in the pouring crucible or the addition of sodium zinc or sodium lead). Some melt under a cover of soda ash, which is fairly basic and may reduce some oxides and sulphur. It must be remembered that when you use an item such as sodium zinc or lead, you are adding zinc or lead to your melt which must be accounted for. Char-

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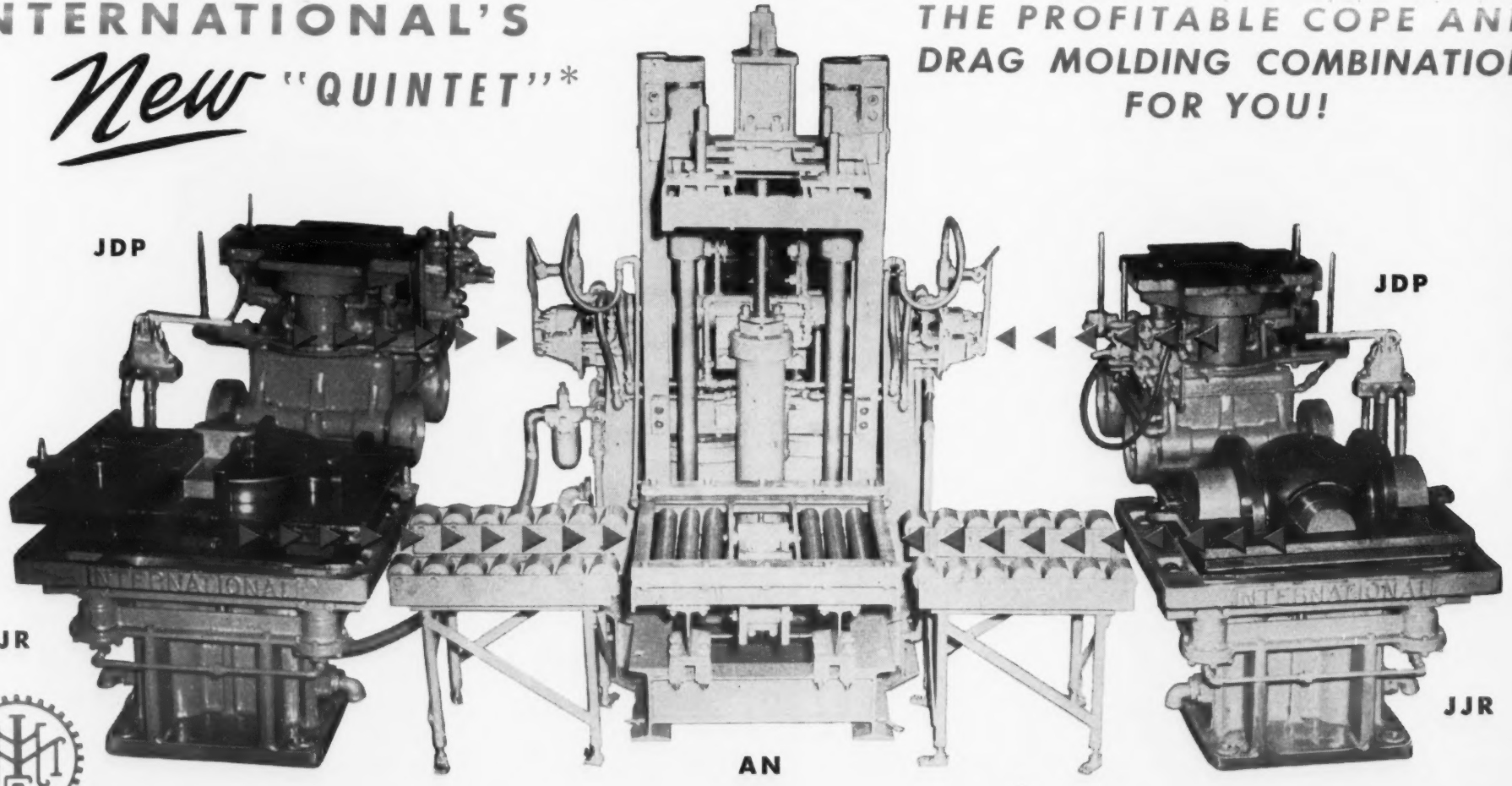

JJR—DOUBLE JOLT MACHINE

Has double jolt feature and is sturdily built to give positive ram throughout core or mold. Jolt capacities range from 750 lbs. to 12,000 lbs.

JDP—COPE MACHINE

Adaptable to large range of work suitable to pin lift style and readily adjustable. Exclusive feature is its positive jolt and true ram accomplished by use of double jolt section combined in one integral part. Will handle loads from 750 lbs. to 3000 lbs.

AN—TURNOVER and DRAWING MACHINE

For clamping and turning over core boxes or flasks and for drawing the core or mold. Easily handles hard-to-draw, short runs and many different sized jobs. No rigging time is required. Capacity—750 lbs. to 10,000 lbs.

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These individual machines are in combination to give you a complete cope and drag molding setup for both short and long production runs.

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*International's System, illustrated by the "Quintet" shows just one of the many possible combinations.

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Highest quality foundry coke for over fifty years.
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coal, glass, borax, sand, lime, bone ash, etc., are used as cover materials.

Make certain when using charcoal that it is dry, or it will cause you trouble. Ran across a shop where they used iron oxide from the core room in the heat. When the heat was ready to pull, about two tablespoons of iron oxide was well stirred in. The metal then was brought up to temperature, pulled, skimmed and deoxidized with phosphor copper. The metal looked good, and I was told that this practice had been used for years.

Flux Can Attack Crucibles

Some fluxes have been known to attack the bonding material in both clay graphite and silicon carbide crucibles. Also, a very high oxygen content in the products of combustion will have an effect on the graphite in clay graphite crucibles, along with an excessive metal loss due to oxidation. Cross check with your crucible house and your flux source to make certain that the flux will not produce any adverse effect or result in a chemical action which is destructive to your crucible. In this way your flux vendor can better advise you as to which of his fluxes you should use. Yellow brasses and high zinc alloys furnish their own flushing action by the continued volatilization of the zinc and seldom require any additional treatment.

The actual introduction of oxygen into molten metal is a simple process and if properly done is in most cases beneficial to the heat; but it will change the chemical analysis of the metal. All that is required is a tank of oxygen, 25 ft of oxygen hose, a regulator, a needle valve and a 4 or 5-ft length of ¼-in. black iron gas pipe. The pipe should be coated with a good wash and dried just prior to its use.

The metal is superheated to approximately 100°F above the desired pouring temperature. The oxygen regulator is set at 5 lb or so and the needle valve opened. The pipe or lance then is inserted into the crucible to the bottom, allowing the oxygen to bubble up through the melt and flush out the hydrogen. Some operators use a neutral gas such as dry nitrogen.

The following is the actual chemical analysis of a leaded semi-red brass with and without a light oxygen blow and serves only to illustrate what takes place. The heat consisted of 250 lb foundry returns, 150 lb yellow condenser tubes and

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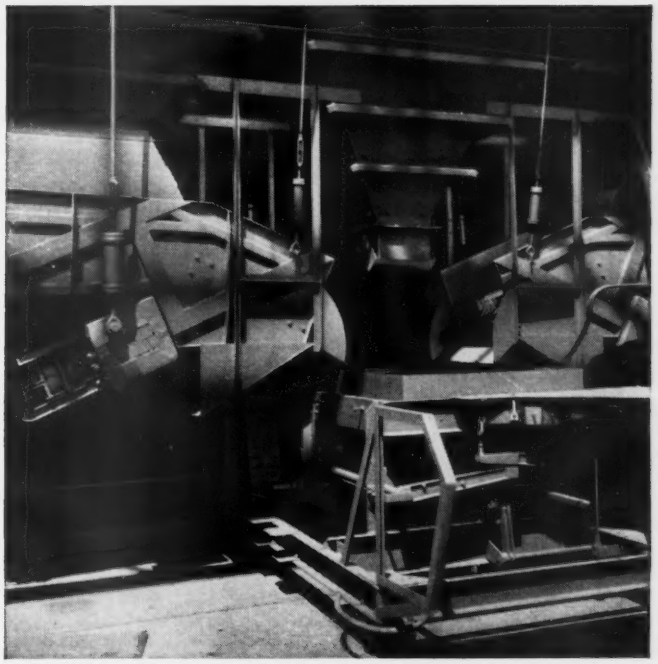
JEFFREY puts VIBRATION to work in the foundry



Feeding—The flow of such materials as sand, coke, limestone, iron borings and castings is positively controlled by JEFFREY vibrating feeders. Rate of feed can be changed while a unit is running, and the response is instantaneous. No mechanical adjustments are required and power consumption is low. Units shown are vibrating feeders with grizzly sections, delivering coke and limestone from bin storage to a weigh car.

Conveying—JEFFREY mechanical vibrating conveyors are widely used for handling foundry sand and castings. Their gentle, but positive, conveying action does not tumble or degrade even fragile castings. Units are compact, sturdy and dustproof, with no wearing parts in contact with conveyed materials.

Cooling—Castings move slowly along this JEFFREY mechanical vibrating conveyor, which serves as a cooling means. Similar conveyors within the foundry carry small poured molds to the shakeout.

For a free copy of Catalog 845 describing foundry equipment, write to The Jeffrey Manufacturing Company, Columbus 16, Ohio.

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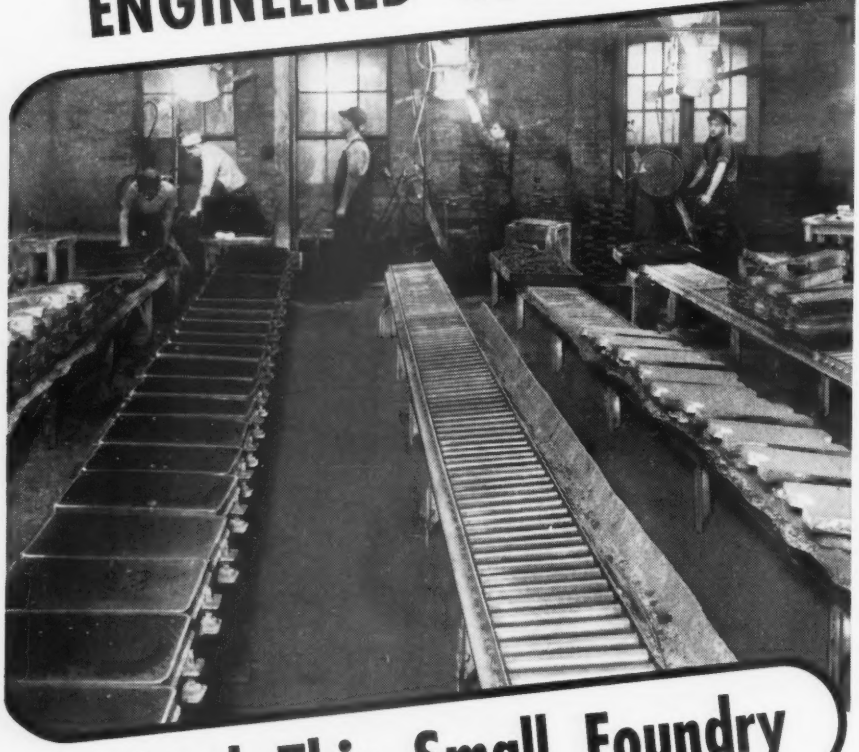

Helped This Small Foundry
INCREASE PRODUCTION 40%

ILLUSTRATING how the operation of a small plant can be made *more* efficient through the installation of an A-F *Engineered* Conveying System, this small Ohio foundry was able to easily increase its production 40% without increasing its floor space.

In small foundries especially, efficient operation makes the big difference between loss—and profit! But no matter how small or how large *your* foundry may be, you too can boost your production and reduce costs with an A-F *Engineered* Conveying System. Just think of being able to re-use sand four, five or more times a day, of re-using flasks many more times a day, and of improving the quality of your product while reducing rejects and breakage!

Without obligation on your part, write for a discussion of your sand, mold and flask handling problems—today.

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SINCE 1901...FIRST IN PRODUCTS HANDLING EQUIPMENT

300 lb auto radiators. The furnace was adjusted slightly until it was oxidizing, by zinc test and by observation. It was a tilting type crucible fired with natural gas at 1000 Btu per cubic foot. When the heat was just liquid, ½-lb of soda ash was added and rabbled in. The heat then was brought up to a temperature of 2200°F and deoxidized with 1¾ oz of phosphor copper per 100 lb of melt. Three fracture tests were poured and broken. The fracture showed a coarse grain, large yellow flecks throughout and the presence of gas. The heat was blown with pure oxygen for a period of 7 seconds at 5 psi with a ¼-in. lance, then again deoxidized with 15 per cent phosphor copper, 1¾ oz per hundred. Three fracture test bars were poured and broken, and each showed a very nice, close grain and a blue gray fracture, with no spots and no gas present.

The heat was then poured into castings which later were polished, plated and subsequently were pressure tested.

The actual chemical made by electrolytic analysis was as follows:

No Oxygen		Blown with Pure Oxygen for 7 Sec.	
Cu	79.28	Cu	79.41
Sn	3.42	Sn	3.52
Sb	0.10	Sb	0.10
Fe	0.34	Fe	0.30
Pb	9.07	Pb	8.75
Zn	7.85	Zn	7.67

So there you have it. Consult your source of crucibles, fluxes and ingots for the practice best suited to your operation, and purchase prepared products. Compounding your own is costly and sometimes fatal. Maintain an oxidizing furnace atmosphere, 0.5 per cent oxygen. Use dry ladles, etc., deoxidize, and take frequent fracture tests. A gassed heat in most cases can be saved by an oxygen blow and deoxidation with phosphor copper, lithium or any other deoxidizer. Take great care not to allow even a small piece of oxidized metal to enter the mold cavity. It usually is reduced back as metal and will produce a string of bubbles, P_2O_5, small to large. A neutral slag will not gas. Make sure all oxides are removed from the ladle and metal by skimming. Cleanliness of operation and equipment is synonymous with good, clean results.

Sincerely,
Charlie

a reminder of

the economic and production advantages of

shell molding

1. Molds are dry and porous, permitting quick elimination of gases; minimum back pressure is built up.

2. Very accurate dimensions are obtained; tolerances of a few thousandths of an inch are possible.

3. Very smooth surfaces can be obtained on cast pieces, and considerable machining is eliminated.

4. Fewer surface defects and smoother surfaces result in stronger castings, allowing thinner sections.

5. Uniformity of resin-sand mix in molds eliminates rejects caused by variations in moisture and clay content in usual molding sand.

6. Cleaning of castings is minimized and shot blasting is practically eliminated.

7. Some parts which formerly had to be made in two or more pieces to allow for machining may be made in one piece because of the reduction in the amount of machining needed.

8. Saving of metal by elimination of risers, by more efficient coring, etc., results in a much higher yield from metal used than customary.

9. Contamination of casting surfaces is held to a minimum.

10. More molds per day can be made with the same labor and space than by usual methods.

11. Handling of sand is greatly reduced; only about 5% of the usual amount of sand is used.

12. Handling and storage of flasks are eliminated.

13. Unskilled labor can be used for making the precision molds.

14. Molds have no affinity for water and may be stored indefinitely.

15. Cores being hollow and dry allow quick escape of gases; also, they collapse readily.

16. More castings per unit of floor space can be poured at one time because molds are smaller and are poured in upright position.

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Plastics Engineering Company has played an important part in the development of shell molding since it was first introduced to this country in 1947. Plenco shell molding resins are known for their consistent dependability, and versatility. You can take advantage of Plenco's experience and research in this field by writing or calling . . .

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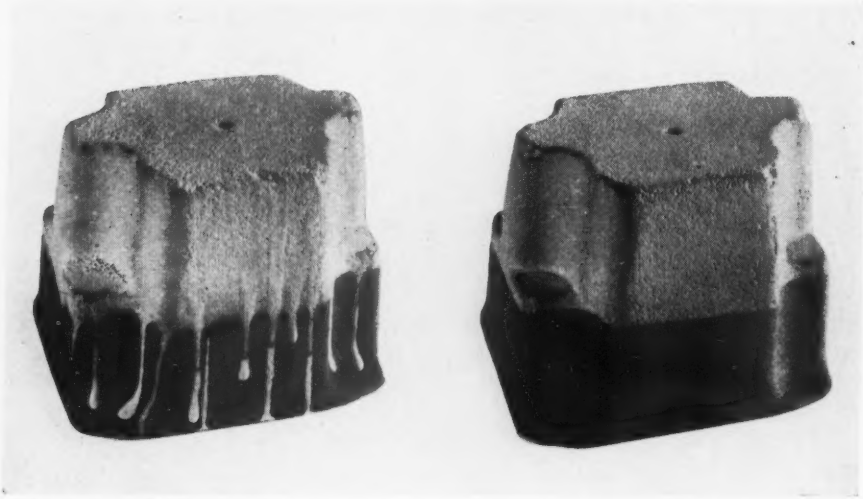


Core Coating: Frederic B. Stevens Inc., Detroit 16, Mich.—Nondrip, carbon-free refractory core coating recommended by manufacturer for steel, gray iron and nonferrous metals is claimed to penetrate deep into cores to prevent metal penetration and at the same time deposit a uniform surface coating to prevent "burn-in" and sand sintering. Maximum fill reportedly is obtained on porous core areas. The material does not streak, tear drop, run down or build up in fillets, is easy to mix and eliminates core scraping, according to the manufacturer.

For More Details Circle No. 1—Page 245

Thread Compound: Crane Packing Co., 1800 Cuyler Ave., Chicago 11, Ill. — High-temperature thread compound protects against the welding action of threaded connections subjected to prolonged exposure to extreme heat. It is said to prevent seizing and galling at operating temperatures up to 1200° F. Compound is nondrip and nonhardening and permits easy disassembly of threaded connections even after lengthy service under severe conditions, according to the manufacturer.

For More Details Circle No. 2—Page 245

Aluminum Alloy: George Salls Metals Co., 2300 East Butler St., Philadelphia 37, Pa.—Aluminum alloy is for use in making aluminum matchplates. Alloy is said to produce an extremely bright surface and on jobs where a highly polished surface is required the alloy facilitates the operation, according to the manufacturer. Producer does not recommend the alloy for general casting use because of its cost but reports it does have economic use in specialized applications.

For More Details Circle No. 3—Page 245

Mercury Lamps: General Electric Co., Nela Park, Cleveland 12, O.—Reported improvements in four of company's 400-w mercury lamps are said to produce from 5 to 12 per cent more light initially, give better light maintenance, have longer life and provide more economical lighting for streets, factories and many outdoor areas.

For More Details Circle No. 4—Page 245

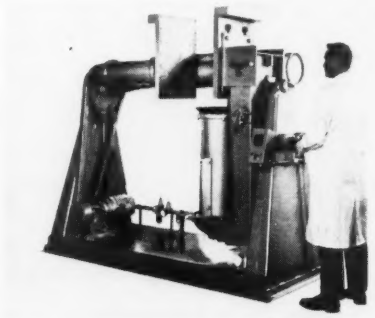
Flexible Wheels: Merit Products Inc., 4623 Irving Place, Culver City, Calif.—Flexible grinding wheels consisting of hundreds of "leaves" of aluminum oxide abrasive cloth sealed together at the hub are designed for light grinding, burr shagging and polishing of flat or contoured surfaces. Range of grits from 40 to 320 can be supplied. Wheels are provided with flanges to fit any threaded spindle. They may be mounted on grinders, buffers, motor shafts, polishing jacks or automatics. Several wheels may be ganged on one spindle to cover a broad surface, each wheel flexing individually to follow contours.

For More Details Circle No. 5—Page 245

Melting Furnace: Johnston Mfg. Co., 2825 East Hennepin Ave., Minneapolis 13, Minn.—Gas or oil-fired, tilting pot furnaces of 2000 lb capacity are for melting Kirksite, lead, aluminum and other white metals. Pot type, stationary furnaces for permanent mold work with optional cast iron pot or silicon carbide bowl also can be supplied.

For More Details Circle No. 6—Page 245

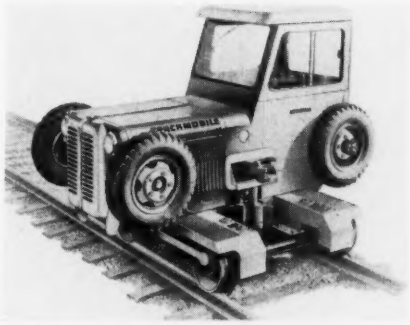
Shell Core Blower: Shallway Corp., 1000 South Fourth St., Connellsville, Pa.—Shell core blower, fully mechanized for pushbutton control, is designed for coreboxes up to 18 x 30 x 12 in. across the parting line and can be altered to accommodate coreboxes up to 36 in. long. Corebox halves are mounted on electrically heated cast iron plates which are opened and closed by electric gear motors. Sand is blown into the box under pressure. Unit is inverted to return excess sand to the blowhead. Cores are produced at rate of one corebox every minute. Since core is cured, there are no subsequent handling operations. Drier plates and core ovens are eliminated.



For More Details Circle No. 7—Page 245

Freight Car Spotter: Whiting Corp., Harvey, Ill.—Heavy duty tractor unit is designed to haul, switch and spot railroad cars. It travels on roadways, or across track, on four pneumatic wheels. When astride a track, the automotive type road wheels are retracted and the machine rests on steel rail wheels. A

For More Details on These Items
Use Reply Card—Page 245



constant - pressure hydraulic jack lifts the freight car slightly and transfers part of the car's weight to the tractor, enabling it to develop a draw-bar pull of as much as 12,800 lb. All controls, including those for positioning, raising and lowering the automotive type wheels, and coupling and uncoupling, are located in the glass-enclosed cab. When not being used to spot cars, the unit can double as a tractor for pulling carts and skids on its pneumatic road wheels.

For More Details Circle No. 8—Page 245

Batch Ovens: Blue M Electric Co., 138th & Chatham St., Blue Island, Ill.—Control system in batch ovens automatically proportions wattage in direct relation to operating temperature and work load, resulting in straight line control throughout entire oven range. Ovens are constructed of heavy-gage steel, have a temperature range from 100 to 600° F and are manufactured in five sizes from 16 to 96 cu ft. Standard voltages are 220 or 440 v, 3-phase, 60 cycle ac.

For More Details Circle No. 9—Page 245

Cutting Tools: Severance Tool Industries Inc., 753 Iowa St., Saginaw, Mich.—Rotary cutting and deburring tools with solid carbide cutting heads can be used for removing gates, fins and risers, breaking sharp corners and edges, machining carbon, finishing castings of any material, working fillets, radii and grooves, deburring oil holes, blending welded and assembled parts and smoothing weld beads.

For More Details Circle No. 10—Page 245

Hydraulic Vise: Columbian Vise & Mfg. Co., 9021 Bessemer, Cleveland 4, O.—Hydraulic vise is controlled by two foot pedals to leave operator's hands free for handling and positioning. Stop control is adjustable so the vise grips and holds work with a single power stroke. Power pump contains a replaceable cartridge which can be moved and replaced as a unit. Malleable iron vise castings are guaranteed unbreakable. Jaw width is 6 in., depth is 3⅞ in., and jaw opening is 6 in.

For More Details Circle No. 11—Page 245

Pneumatic Silencers: C. W. Morris Co., 10628 Cloverdale, Detroit 4, Mich.—Pneumatic silencers are all-metal units that reduce sound in noise-shock areas close to the level found in the average factory. Silencers contain no parts that need replacing and reportedly are safe for any pressure normally encountered in industrial pneumatic service. Four models are available.

For More Details Circle No. 12—Page 245

Separation Magnets: Ohio Electric Mfg. Co., 5400 Dunham Rd., Maple Heights, Cleveland, O.—Rectangular electromagnetic separation magnets are for removing tramp iron and other undesirable magnetic particles that might damage equipment, cause explosions or contaminate

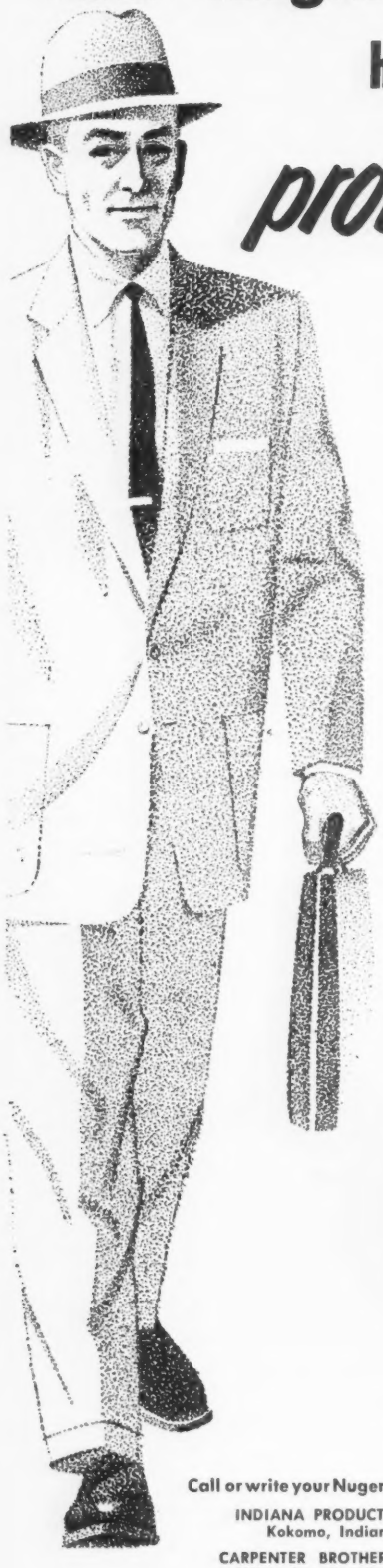
Binder Developed for Use with CO_2 Process

BINDER is for use in making cores or molds with the CO_2 process and is designed to give maximum strength and hardness and permit easy ramming and fast CO_2 gassing. The material is mixed with any clean, washed and dried sand. Sand is blown, jolted or rammed into the box and struck off. CO_2 gas is passed through core for 10 to 30 seconds. Core is removed from box, placed in mold, closed and poured off. Process is said to offer cores without ovens or driers, smoother cores for the same grain size sand, dimensional accuracy, speed, low gas content, minimum of wires and hooks, molds with rigid walls and castings true to pattern, reduced metal shrinkage due to stability of mold wall, no size limitation and low initial investment.

Any clean, washed and dried sand may be used. Ordinary patterns and coreboxes can be used if they are free of back draft and nicks. For a one-man, small scale operation, a 50 lb CO_2 cylinder and pressure reducer will supply sufficient gas for hardening. In the hardened state, strength is reportedly adequate for handling in all normal practices. There is no odor to the binder at time of making and hardening the core and the amount of organic material is small enough so that smoke and gas at pour off is almost negligible. The binder is made by Brumley-Donaldson Co., P. O. Box 58281, Vernon Station, Los Angeles 58, Calif.

For More Details Circle No. 13—Page 245

Your Nugent SAND-MAN helps keep *profits awake!*

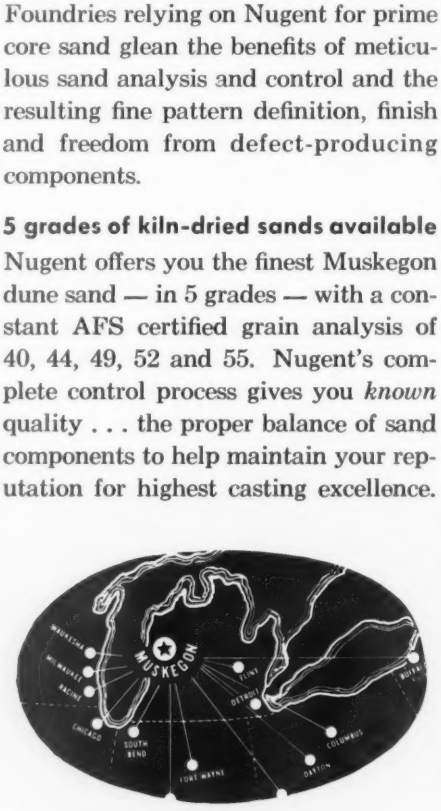


He can show you how Nugent certified sand saves dollars . . . assures less core breakage and consistently uniform molds

You can't afford to let profits "go to sleep" because of inferior core sand. Foundries relying on Nugent for prime core sand glean the benefits of meticulous sand analysis and control and the resulting fine pattern definition, finish and freedom from defect-producing components.

5 grades of kiln-dried sands available

Nugent offers you the finest Muskegon dune sand — in 5 grades — with a constant AFS certified grain analysis of 40, 44, 49, 52 and 55. Nugent's complete control process gives you *known* quality . . . the proper balance of sand components to help maintain your reputation for highest casting excellence.



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Complete shipping and bulk storage facilities, plus services of three major railroads, assure fast action on your order. Let this convenience save you money.

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CORE SAND

Nugent is always ready to serve you with graded sands for the foundry.

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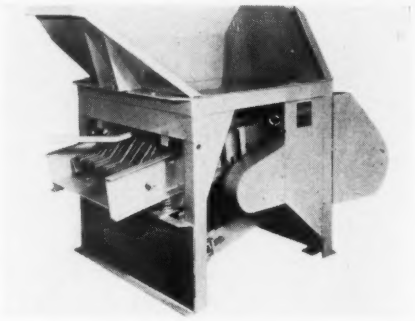
purity of product. Several models are available with an effective range of 6 in. at a belt speed of about 200 fpm up to an effective range of 19 in. at a belt speed of about 500 fpm.
For More Details Circle No. 14—Page 245

Screening Unit: National Engineering Co., Machinery Hall Bldg., Chicago 6, Ill.—Self-contained screening and separating unit is designed for floor use and is equipped with an



adjustable lump breaker. Rated at 50 tons per hour capacity, it has a 30 x 60 in. screen, 30 cu ft hopper and a radial type magnetic pulley for tramp iron removal. Protective seal between belt and screen and below belt keeps sand from moving parts. To facilitate maintenance and clean up, the unit is designed to provide no obstruction at floor level.
For More Details Circle No. 15—Page 245

Soft Hammer Mold: General Scientific Equipment Co., 2700 West Huntingdon St., Philadelphia 32, Pa.—Soft hammers of lead, white metal or babbitt can be made in mold.

Mold is complete with one reusable metal handle. Additional handles can be provided. Hammers can be recast when they lose shape through use.
For More Details Circle No. 16—Page 245

Cut-Off Wheels: Bonded Abrasive Division, Carborundum Co., Niagara Falls, N. Y.—Cut-off wheels are available in three grades for operations that require minimum burn and burr, general purpose work where some burn and burring is acceptable and for rough work where maximum wheel life is the important factor. Sizes range from 6 to 20

HERE ARE QUICK REVIEWS OF NEW LITERATURE—available to foundrymen as "idea" and reference information. Readers in the United States and Canada may obtain copies by using the attached cards. Readers in foreign countries should write direct to the manufacturer offering literature.

81. Release Agents

Dow Corning Corp., Midland, Mich. —Reference 5-109 provides general information, typical physical properties and suggested procedures for using two silicone parting agents compounded primarily for shell molding use. One fluid is a 5 per cent solution of high viscosity silicone in solvent that reportedly is effective on patterns having deep draws and only slight draft. Other agent is a 50 per cent solution of the same silicone but packaged for those who desire to do their own diluting.

82. Core Binder

B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, O.—Service bulletin GC-25 introduces a core binding material that reportedly offers these advantages: Fast baking, negligible gas formation, excellent collapsibility and shakeout, dimensional stability, tolerance for "over baking," unharmed by air drying prior to baking and storage ability. The binder is a viscous, water solution of a special noncuring synthetic resin.

83. Potentiometer

Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.—Data sheet E-51(3) describes the circuitry and construction of potentiometer and points out the widespread use of the instrument in industrial and research laboratories for potential difference measurements, instrument checking and precise temperature measurements.

84. Slings

Union Wire Rope Corp., 2100 Manchester Ave., Kansas City, Mo. —Sling handbook SL-2 contains illustrations, charts and diagrams describing factory-fitted slings and standard fittings available for slings. Rigger's manual, shop chart of ratings for slings, engineer's notebook and standard signals for directing operations of overhead traveling cranes, cranes, derricks and locomotives also are included.

85. Temperature Measurement

Tempil Corp., 132 West 22nd St., New York 11, N. Y.—Booklet, "How Temperatures Are Measured," covers heat and temperature as separate concepts, history of scales commonly used, physical effects associated with rise in temperature and how thermometers and pyrometers use these effects and monitoring surface temperature by means of changes in color or physical state.

86. Sand Preparation

National Engineering Co., 549 West Washington Blvd., Chicago 6, Ill.—Bulletin 517 is intended for engineers and contains information for those interested in laying out new sand preparing systems or revising existing arrangements. Complete specifications of various types of units are offered.

87. Materials Handling

Magnesium Co. of America, Materials Handling Division, East Chicago 19, Ind.—Solutions to 13 dock loading and yard loading problems are outlined in folder. A line drawing illustrates the problem and a photograph is used to show how problem was solved by use of a magnesium dockboard or yard ramp.

88. Wet Sand Reclamation

Eimco Corp., 301 South Hicks Rd., Palatine, Ill.—Bulletin F-2033C contains informational questions and answers concerning wet sand reclamation systems said to eliminate up to 75 per cent of foundry sand storage space requirements and pay for themselves within 1 to 3 yr.

89. Ladle Lining

J. H. France Refractories Co., 1918 France Rd., Snow Shoe, Pa.—Advantages, recommendations for use, and

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methods of installation for a graphitic plastic firebrick for ferrous and nonferrous linings in ladles, runners, spouts and metallurgical furnaces are found in bulletin.

90. Stainless Steel

Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22, Pa.—Booklet 5 in technical series presents tables on mechanical properties, stress rupture properties, elevated tensile properties, corrosion rates in various media and effects of cold rolling and aging on hardness and tensile properties of a new stainless steel that bridges the gap between the 300 and 400 series.

91. Castings

International Nickel Co., 67 Wall St., New York 5, N. Y.—Case history booklet, "Cast to Outlast," describes how many destructive service problems can be solved by use of sand and centrifugal castings. Properties, alloys available, range of forms, specification data and notes on joining and machining are included.

92. Grating Spectrograph

Baird Associates Inc., 33 University Rd., Cambridge 38, Mass.—Bulletin 52 covers operating details and specifications of 3-meter concave grating spectrograph utilizing a 20 in. camera with two 10 in. plates mounted side by side on the plateholder.

93. Cupola Flux

Cleveland Flux Co., 1026 Main Ave., N. W., Cleveland 13, O.—Advantages and instructions for use of scored brick cupola flux are found in bulletin 46-B. Each brick is scored to form one lb briquets said to be the correct amount of flux for 500 lb of iron.

94. Constant Speed Drives

Allis-Chalmers Mfg. Co., 1032 South 70th St., Milwaukee 1, Wis.—Design features, basic drive principles, technical data on sheaves and V-belt drives are included in Tex-Book 20P40. Multicolor tables are provided to aid in rapid selection constant speed V-belt drives.

95. Magnetic Pulleys

Stearns Magnetic Inc., Milwaukee 46, Wis.—Electromagnetic pulley and pulley separator bulletin 303-C details specifications of pulleys and pulley separators and offers a simplified selection method which aids selection of the right size pulley for a particular application.

96. Titanium

E. I. duPont de Nemours & Co., Wilmington 98, Del. — Illustrated booklet, "Titanium Progress Report No. 2," gives current data on properties of titanium and discusses methods of fabricating the lightweight metal. Expanding range of commercial applications of titanium is indicated by photographs.

97. Test Bars

George Sall Metals Co., 2300 East Butler St., Philadelphia 37, Pa.—Booklet, "How to Make Good Test Bars," covers the design and making of aluminum and copper-base test bars. Melting and pouring procedures are emphasized as being important in producing good test bars with recommended temperatures pouring procedures and shakeout times listed for various alloys.

98. Friction Clutch

Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.—Book 2637 describes three friction clutches for power transmission applications and includes horsepower and dimension tables, description of operation and instructions for choosing clutches for given applications.

99. Refractories

Chas. Taylor Sons Co., Subsidiary of National Lead Co., 710 Burns St., Cincinnati, O.—Physical properties and applications of three types of sillimanite or bonded mullite super refractories are illustrated and discussed in bulletin 318. A reversible thermal expansion chart is included.

100. Burn Kit

Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh 8, Pa.—Bulletin 0402-3 contains information on burn kit for immediate treatment of all types of burns by use of the aerosol spray technique and first aid dressing and accessories.

101. Continuous

Dike-O-Seal Inc., 1209 West 59th St., Chicago 36, Ill.—General information and typical applications of continuous molded seal tailored to fit individual coreboxes with a strength exceeding that of the material itself is found in 4-page brochure.

102. Blast Cleaning

Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Bulletin 225 gives construction and operating details on batch blast barrel cleaning equipment in 1½, 3, 6, 12, 18 and 27 cu ft capacity sizes.

103. Shell Core Blower

Shell Process Inc., McKinstry Ave., Chicopee, Mass.—Folder illustrates and describes dual corebox shell core blowing machine that produces completely cured ready-to-set cores.

104. Conveyors

Standard Conveyor Co., North St. Paul 9, Minn.—Bulletin 68 illustrates and describes conveyor installations in foundries and other metalworking industries.

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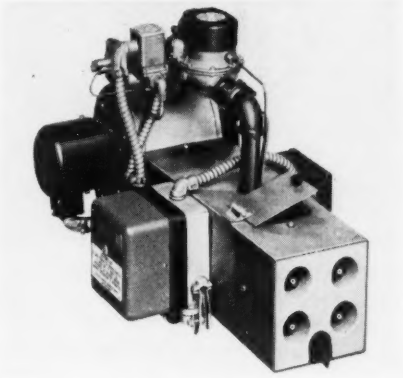
in. in diam and 1/16, 3/32 and ⅛ in. thick Metal bushings are supplied on all arbor holes in range of ⅝ to 1⅜ in. All sizes are available in 24 to 120 grit.

For More Details Circle No. 17—Page 245

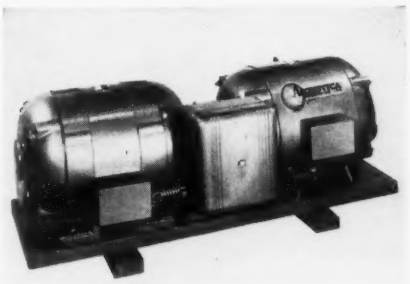
Gas Burner: Mettler Co., Division of Eclipse Fuel Engineering Co., 4366 Worth St., Los Angeles 63, Calif. — Automatic packaged gas



burner operates with air from a lowspeed fan or natural draft and is for conversion of small boilers, furnaces and process heating equipment. Valves, motorized fan, air register, control mechanism, pilot and gas pressure regulator plus electric starting and operational relays are included in the package.

For More Details Circle No. 18—Page 245

Generators: Acoustica Associates Inc., Glenwood Landing, Long Island, N. Y.—High-frequency rotating generators ranging in size from 2 to 150 kw can supply power to energize multiple arrays of above-



audible sound generating transducers to irradiate materials and products being processed en masse, as in degassing molten metals, plating, cleaning and degreasing as well as energizing drilling, cutting and grinding machines. Dimensions, type and ultrasonic character of the transducer, as well as their critical disposition in processing equipment, must be engineered specifically for each application.

For More Details Circle No. 19—Page 245

Air Motor: Bellows Co., Akron 9, O.—Company has added to its air cylinder line a 2½-in. bore air mo-

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Efficient electric hoists...to move materials overhead and release floor space for more valuable operations.

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CM LODESTAR ELECTRIC CHAIN HOIST
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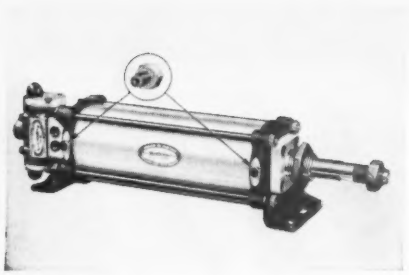

tor with adjustable cushioning at either or both ends and available in all standard mounting styles. Operating at air pressures as high as 175 psi, it develops a thrust equal to five times the air pressure applied. Unit features built-in 4-way valve and speed controls for 8 v or 110 v momentary contact electrical control; 12, 110, 220 or 440 v maintained contact control; direct manual or mechanical control; air-pilot valve control and air-poppet valve control.

For More Details Circle No. 20—Page 245

Snagging Grinder: Hammond Machinery Builders Inc., 1600 Douglas Ave., Kalamazoo, Mich.—Tool and snagging grinder has a self-contained built-in dust collector that permits servicing from front of machine. Three sizes powered by 1, 2 and 3-hp motors and using 10, 12 and 14-in. wheels can be supplied. Grinder can be placed against a wall and requires practically the same floor space as a grinder without the dust collector unit.

For More Details Circle No. 21—Page 245

Materials Handling: Market Forge Co., Materials Handling Division, 35 Garvey St., Everett 49, Mass.—Skids, semiskids and floor trucks for a multitude of materials handling applications feature all-welded longitudinal panels engineered for maximum strength, versatility and cleanliness with minimum weight.

For More Details Circle No. 22—Page 245

Furnace Leads: Inductotherm Corp., 412 Illinois Ave., Delanco, N. J.—Method of introducing high frequency water-cooled leads to melting furnaces through the furnace trunnion instead of through the rear of the furnace obviates the need for long leads and deep pits at the rear. Furnaces incorporating the new design have been built for air and vacuum melting in capacities of 30 to 2000 lb for ferrous and nonferrous melting and can be used with either single or two point pouring.

For More Details Circle No. 23—Page 245

Dust Filter: Day Co., 810 Third Ave. N. E., Minneapolis, Minn.—Reverse jet type dust filter is housed in structure that features a walk-in access door and two small inspection doors to speed inspection of the op-

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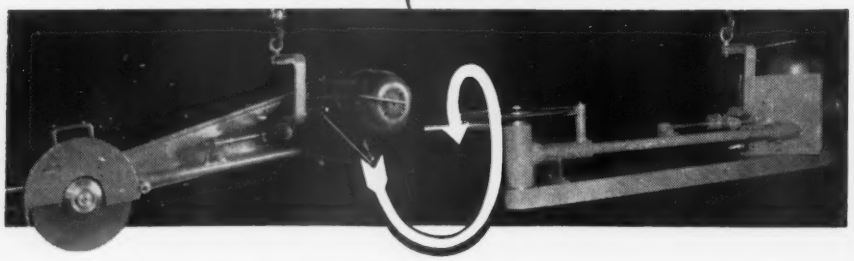

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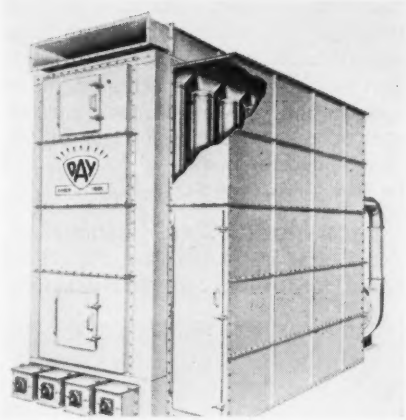
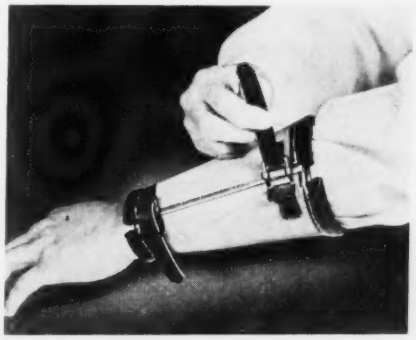


erating mechanism. Small access doors located at top and bottom of filter chamber allow periodic lubrication and inspection of gearmotor drive which operates the reverse jet air pressure blower and screw conveyor discharges.

For More Details Circle No. 24—Page 245

Arm Protector: Wheeler Protective Apparel Inc., 224 West Huron St., Chicago 10, Ill.—Lightweight arm protector features a wire mesh construction which allows free movement of air to arm of wearer yet



affords protection against flying objects, abrasion and cutting. A lock slide closure is incorporated into the straps and permits full adjustment. Protector is large enough to wrap fully around the arm.

For More Details Circle No. 25—Page 245

Masonry Saws: Clipper Mfg. Co., 2800 Warwick, Kansas City 8, Mo.—Masonry saws for production cutting of every masonry or refractory material, regardless of size, are powered with 2-hp continuous duty motors. Two blade sizes, 14 and 18 in., are supplied for wet and dry cutting or for dry cutting only. A wet cutting kit is available to convert a dry cutting saw to a wet and dry saw.

For More Details Circle No. 26—Page 245

Ratchet Lever Hoists: Duff-Norton Co., Coffing Hoist Division, Danville, Ill.—Two light coil chain ratchet lever hoists have capacities of 1½ and 3 tons. Smaller model with single chain has a standard lift of 56½ in., minimum distance of 14 in. between hooks and requires a lever pull of 60½ lb to lift the rated capacity. The 3-ton double chain model has a standard lift of 57 in., minimum distance of 18½ in. between hooks and takes a lever pull of 62 lb to lift the rated capacity.

For More Details Circle No. 27—Page 245

Aluminum Putty: Chemical Development Corp., Danvers, Mass.—Aluminum putty of about 80 per cent

aluminum and 20 per cent plastic is claimed to have excellent adherence to aluminum, steel, bronze, brass and cast iron. Manufacturer reports that it is being used for filling large and

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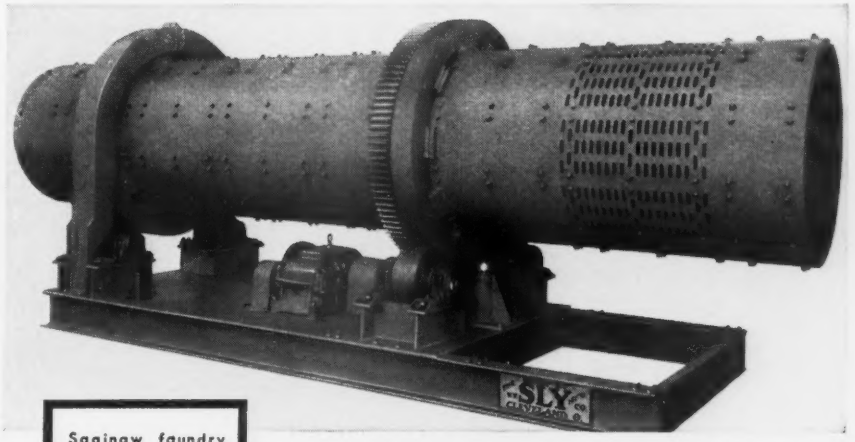

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SLY MILL cleans, defins red-hot castings in continuous flow

Because of the Sly Continuous Tumbling Mill, cleaning is a constant production flow at a well-known Saginaw, Michigan, foundry. Red-hot malleable iron castings and sprues are conveyed — at the rate of 10 tons per hour — direct from shakeout through the Sly Mill and out in one non-stop operation. The mill *removes fins as it cleans*, saving many hours of grinding time otherwise needed.

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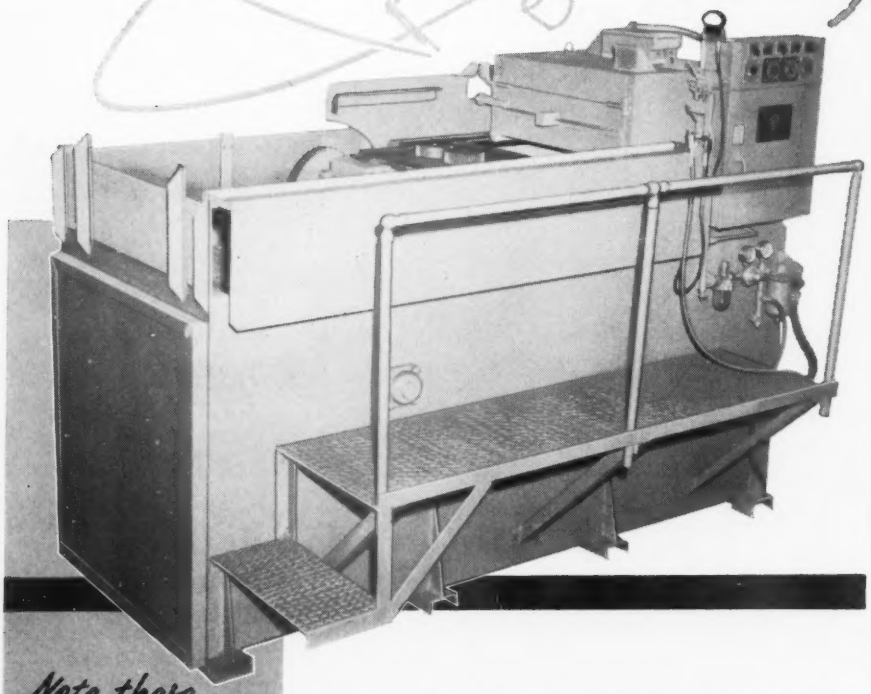

Note these Features!

- Infra-red radiant heat curing oven
- Automatic shell ejection system
- Permanent built-in infra-red pattern heating
- Interlocked for safe operation
- Adjustable pneumatic controls
- Cushioned air cylinders
- Machine can be pitted below floor level or used with platform
- 20" x 26" pattern area x 8" depth
- Automatic louvers for vertical drop of sand
- 700 lb. sand capacity

Increase your foundry production, reduce labor costs, sand handling, metal wastage and machining operations, and put precision shell molding on a *push button* production basis —with the *new* . . .

SHELL-O-MATIC
Automatic Shell Molding Machine

A complete cycle from heating of pattern to inspection of finished precision shell takes *less than 70 seconds* with this fully automatic machine. Unskilled personnel can easily handle its most simple operation and yet produce 50 or more completely cured shells per hour! Pattern changeover is a matter of minutes. Quickly installed—one electrical and one air connection and machine is ready for operation.

Write, wire or phone for complete details showing how SHELL-O-MATIC can reduce costs and increase production in *your* foundry.

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small holes in aluminum and steel castings (see photo), to cover holes which have been drilled incorrectly and to build up worn sections. Material uses a special hardening agent and once set becomes a rigid, strong tough piece of metal.

For More Details Circle No. 28—Page 245

Face Mask: Scott Aviation Corp., 365-P Erie St., Lancaster, Pa.—Face mask for firefighting and industrial

safety applications incorporates a wrap-around plastic shield that eliminates separate eye pieces. Nonfogging is assured by circular airwashing action of oxygen supply. Double lip seal makes mask comfortable when worn for extended periods. Mask can be donned with one hand, leaving other free for use in emergency situations.

For More Details Circle No. 29—Page 245

Marking Lacquer: Zip Abrasive Co., 1360 West 9th St., Cleveland 13, O.—Metal bars and other forms in warehouses and plants can now be identified by applying a color identification by a spray can that eliminates need for keeping paints, brushes or bulky equipment available. Spray cans are available in one dozen assortments of various colors, as well as cases of solid colors. Pattern cards for masking purposes are included in each carton.

For More Details Circle No. 30—Page 245

Arc Welders: Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.—Two engine-driven alternating current arc welders are designed for field production and maintenance welding where the work calls for light, rugged units. Rated welding current is 200 amp, 100 cycle, single phase with a 100 per cent duty cycle. Welding current range is 15 to 200 amperes. Open circuit voltage is 85 volts. In addi-

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  The only insulating firebrick on the market designed for such high temperature service.
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  A *true* 3000° F. insulating firebrick . . . precise data recorded in actual service proves it to be the outstanding brick of its type.
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  Can be used in place of normal fire-clay brick with tremendous savings in weight and fuel costs.
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  Unexcelled for use in heat treating and annealing furnaces in which the temperature does not exceed 2300° F.
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  Designed primarily as a high temperature backing-up insulation, G-20 can also be used in direct contact with flame and furnace gases.

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Toronto 15, Ontario

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A. P. Green Fire Brick Company offers you one source of supply for insulating firebrick for all temperatures from 2000° F. to 3200° F. All A. P. Green insulating firebrick have high insulating value, structural strength and the ability to withstand high temperatures without shrinkage. They are ground to accurate dimensions after firing and are available, in stock, in all standard nine inch series shapes. Information on special shapes and sizes furnished on request.

• distributors in the principal cities of the world.

TIRED OF DUST COLLECTOR MAINTENANCE?

YOU'RE READY FOR NATIONAL HYDRO-FILTER

In the National Hydro-Filter, contaminated air never comes in contact with a dry surface during its passage through the unit.

Water flows countercurrent to the air stream to provide a unique self cleaning action. A turbulent area of water, air, bubbles and mist provides a barrier through which even micron range dust particles cannot pass. And what's more . . . there are no moving parts within the dust collection area—No baffles to clean, no "blind" areas to clog and reduce efficiency.

If you're tired of dust collector maintenance, wary of limited collection efficiency, add up these features: Self cleaning action, no moving parts and automatic sludge removal. They total but *minutes a month* in maintenance.

If you operate wet type dust collection equipment—you're *ready* for maintenance free, constant flow efficiency to the micron range and you're *ready* for Hydro-Filter!

WRITE FOR BULLETIN 55

Describing the unique principle of operation of the National Hydro-Filter

NATIONAL HYDRO-FILTER

Dust Collector Corp.

600 Machinery Hall Bldg.,
Chicago 6, Illinois

Subsidiary of National Engineering Company, Manufacturer of Simpson Mix-Mullers.

tion to welding power, both units can provide 1 kw, 110 v dc auxiliary power. One of the models can be used to supply 4.5 kw, 110 to 220 v, 60 cycle, single phase alternating current power.

For More Details Circle No. 31—Page 245

Resinoid Wheels: Norton Co., Worcester 6, Mass. — Resinoid bond used with new molding and firing techniques is said to insure a uniformity of resinoid bonded grinding wheels from lot to lot to meet requirements demanded by increasing use of automated equipment. Wheels can be supplied in wide range of hardness grades and sizes.

For More Details Circle No. 32—Page 245

Dumping Mechanism: Nolan Corp., Rome 2, N. Y.—Automatic elevating and dumping mechanism is

said to be adaptable to any process requiring top loading of bins, furnaces or other receptacles. Vertical lift of the standard unit is 4 ft. Special units can be made to user's specifications for longer lifts up to several floor heights. Equipment is claimed to be especially useful where high temperatures or other hazardous conditions make hand loading dangerous.

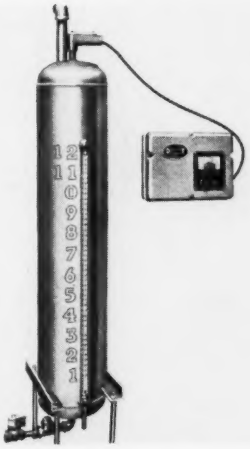
For More Details Circle No. 33—Page 245

Self-Sticking Numbers: W. H. Brady Co., 727 West Glendale Ave., Milwaukee 12, Wis.—Self-sticking numbers and letters in six sizes from ½ to 5 in. are made of impregnated cotton cloth with a temperature-resistant pressure-sensitive adhesive. Numbers will stick to any clean, dry surface, according to the manufacturer.

For More Details Circle No. 34—Page 245

Water-Slurry Dispenser: Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich.—Water and slurry dispenser is for accurate addition of

a preset amount of liquid to a batch type sand mixer. Dial is set by hand to desired number of gallons. Tank will fill to set amount and on electrical signal from a push button or



timer, the liquid will be driven by air into the muller. This type of liquid addition is said to be effective where residual moisture and temperature are constant throughout the day.

For More Details Circle No. 35—Page 245

Sandblast Nozzles: Clementina Ltd., 2277 Jerrold Ave., San Francisco 24, Calif.—Sandblast nozzles with tungsten carbide lining reportedly will fit all sandblast machines now in use and can be supplied in short lengths for close work or in longer lengths for hard to clean surfaces. Orifice sizes from 3/16 to ¾ in. are available.

For More Details Circle No. 36—Page 245

Lift Truck: Hyster Co., 2902 North East Clackamas St., Portland 8, Oreg.—Lift truck consists of single mast of two box type sections, one telescoping within the other. Tor-

sional rigidity in the mast has been increased 80 per cent and mast deflection reduced 50 per cent over conventional upright or mast assemblies, it is claimed. Load raising speed is 58 fpm. Unit has been designed for use with company's gasoline, LP gas or diesel powered trucks with solid-cushion tires for warehouse

Planet belt conveyor transferring briquets to *adjustable* boom conveyor.

This Planet Conveyor Handles Briquets *with kid gloves*

At one of the world's largest automotive foundries, this Planet boom-type belt conveyor makes the vertical adjustment necessary to lower briquets to yard storage level with a minimum of breakage.

The foundry pours over 1,000 tons of gray iron in a 16 hour day. A good percentage of the pouring is cylinder iron which averages 1,000 lbs. of cast iron briquets in each 4,000 lb. metal charge for the cupola.

In the cupola the tremendous air blast delivered by three centrifugal fans, each with a 17,500 cfm rated capacity at 40 oz. pressure, **makes short work of briquet fragments.** Inasmuch as the cast iron briquets make up almost 25% of the metal charge, the savings in keeping briquets intact is considerable . . . results in more metal, less waste.

You can save money with Planet foundry automation. Whatever your specific problem, within the foundry or in yard storage, Planet foundry specialists can cut your operating costs. Start the ball rolling today with a letter or phone call. Phone IVanhoe 4-9433.

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1818 SUNSET AVENUE
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- CONVEYORS
- ENGINEERED SYSTEMS
- FOUNDRY EQUIPMENT
- AUTOMATION
- STEEL FABRICATION

"IT PAYS TO PLAN WITH PLANET"

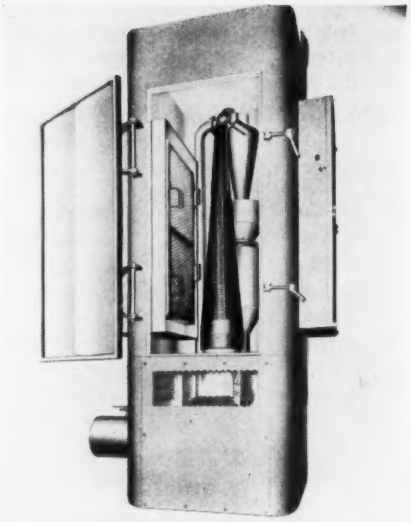
and close quarter operation. Optional standard lift heights up to 12 ft are available.

For More Details Circle No. 37—Page 245

Centrifugal Fan: Ilg Electric Ventilating Co., 2850 North Pulaski Rd., Chicago 41, Ill.—Blade design on line of centrifugal fans is said to develop high efficiencies and quiet operation. Backward-curved, all-aluminum airfoil blade design reportedly produces complete freedom from air flow separation at all normal working pressures. Fans have sparkproof construction and nonoverloading characteristics. Construction meets requirements for Class I and II performance permitting operations up to a maximum tip speed of 35,000 fpm. Six sizes comprise the line.

For More Details Circle No. 38—Page 245

Dust Collector: Green Fuel Economizer Co., Beacon, N. Y. — Packaged dust collection unit is complete within itself and contains a louvered cone and one or more fiber filter packs in series. Cone removes coarser and medium particles from air or gas; filter packs remove submicron particles and other undesirable condensable elements. Capacities range from 1000 to 10,000 cfm free air. Power requirements range from 1½ to 15 hp with the motor assembled with the unit.

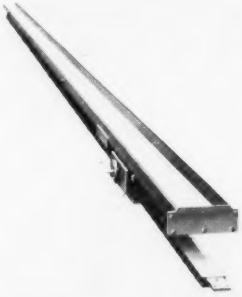


For More Details Circle No. 39—Page 245

Welder: Harnischfeger Corp., Milwaukee 46, Wis.—Constant-voltage welders allow the operator to select the arc voltage he desires. Voltage then remains constant during the entire welding cycle. Selection of the correct rod feed and travel rate provide the desired deposit rate.

For More Details Circle No. 40—Page 245

Vibrating Conveyor: Jeffrey Mfg. Co., Columbus 16, O.—Lightweight mechanical vibrating conveyor is built in 12-ft sections in deck widths of 5, 8, 12, 18 and 24 in. Odd lengths can be made by cutting sections. Height from floor is 14 in. maximum. Totally enclosed, oil immersed drive prevents foreign matter from entering drive mechanism.



For More Details Circle No. 41—Page 245

Valve: Magnatrol Valve Corp., 71 Fifth Ave., Hawthorne, N. J.—Full port, normally closed valve does not require back pressure to operate. It will operate and hold fully open with low or no flow pressure. On gas lines to burners of industrial ovens, furnaces and boilers, the valve can handle low as well as high pressures induced by gas boosters and air

25-lb. plating work carrier cast in high-conductivity beryllium copper and used in plating equipment made by The Udylite Corporation.

WHEN PARTS ARE CAST FOR A TOUGH ROLE THEY'RE MADE OF BERYLCO® BERYLLIUM COPPER

The increased amperage called for in modern plating equipment demands higher conductivity in this casting—a contact which rides on a copper bus bar and transmits current from the bar to the plating tanks. Various materials used in the past, although they had the required wear resistance, lacked the conductivity for this application.

Our engineers recommended that the part be cast in "Berylco." The solution was ideal. "Berylco" not only combines high conductivity with high strength and remarkable wear resistance, but is also a very good casting alloy. Pouring temperatures are low, fluidity is excellent, and needed detail can be sharply reproduced. Most important, cost is competitive.

INTERESTED IN CASTING APPLICATIONS?

We will be glad to assist you with any specific questions you may have on beryllium copper castings. Just drop us a line. If your interest is general, write for your free copy of "Berylco Beryllium Copper Casting Alloys," which packs a wealth of information into four pages.

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blowers, according to the maker. Valve is suited also for use on vacuum lines as well as in control of liquids in wide range of viscosities.

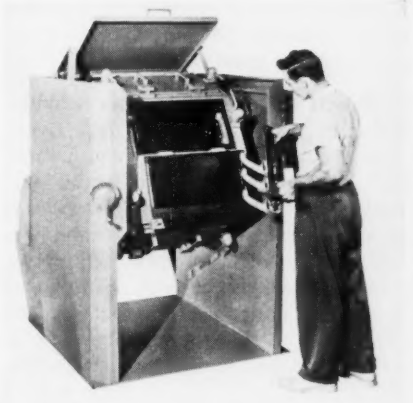
For More Details Circle No. 42—Page 245

Viewing Microscope: William J. Hacker & Co., 82 Beaver St., New York 5, N. Y.—Microscope contains a built-in illuminating system and

projection elements to render an image on an 8-in. viewing screen. Magnification range is from 75 to 1000X and is facilitated by a set of three or four achromatic objectives on a revolving nosepiece and a built-in plane eyepiece. For photomicrography, the viewing screen is replaced by a vertically or horizontally adjustable frame with a holder for plates or cut film.

For More Details Circle No. 43—Page 245

Finishing Machine: Roto-Finish Co., Kalamazoo, Mich.—Stationary finishing machine is for coloring aluminum castings. Unit has a door on each flat of a single compartment



cylinder. Fixture pads are attached to the octagon side walls just inside the door opening. Parts are held by the fixture to effectively expose them to the processing media. It is not necessary to remove processing media or solution when removing work load from cabinet. Various sizes of compartments, from 48 in. long to 42 in. in diam, can be supplied.

For More Details Circle No. 44—Page 245

Exhaust Fan: American Blower Corp., Detroit 32, Mich.—Heavy duty propeller type exhaust fan is available with two-speed or constant-speed direct drive totally enclosed motors. A range of sizes with capacities from 587 to 12,800 cfm can be supplied. Fan will operate against static pressures up to ⅝ in. Air delivery ratings are in accordance with the standard test code for centrifugal and propeller fans and conform with the Dept. of Commerce commercial standard.

For More Details Circle No. 45—Page 245

Fuel Oil Additive: Stewart-Hall Chemical Corp., P. O. Box 66, Fleetwood Station, Mt. Vernon, N. Y.—Noncorrosive, nonexplosive additive for No. 4, 5 and 6 oil is designed to break up oil-water gels, dissolve sludge and emulsify water in the oil. Material has a flash point of 206° F and a U. S. Coast Guard certification No. 121. When used, according to the

SOCK
for the socket!
AIR
New
Rotor J-2L
Impact
Wrench
cuts time 23%
ROTOR TOOLS CLEVE-O
Formerly used electric nut setter for assembly of garden tools. Switch to Rotor J-2L Air-powered Impact Wrench cut job time 23%. Savings paid for tool in 12½ weeks.
New J-2L Impact Wrench is reversible . . . specially designed for minimum maintenance.
Find out how *you* can cut costs with the rugged, lightweight J-2L and other new Rotor Tools! Ask for Bulletin 41.
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SHOVELOADER

saves up to $400 on initial cost

Now you can mechanize your bulk handling operations for less than $10.00 per day for one year . . . much less than you pay a laborer with a hand shovel!

This rugged Model 20 SHOVELOADER has a lifting capacity of 1500 pounds, and lifting height of 7 feet. Standard bucket size is 12 cubic feet. Loader arms are in *front* of operator—not around him—protecting him from injury and providing full 360° visibility at all times.

Four forward speeds with top travel speed of 14 MPH make this a *fast* machine and insure better operation on ramps and rough ground conditions.

Bucket tilt-back at ground level means a full load at every grab, and permits low carrying position for travel. Other advantages are longer forward reach, greater longitudinal stability, extremely low maintenance because of easy accessibility of all parts requiring service, and design of the husky, trial-proven engine.

Special attachments are available for special jobs—forks for palletized loads, crane hooks for hoisting, and special buckets for dense materials. Catalytic exhaust system is available for inside work, where required.

Compare these and SHOVELOADER'S many other features with loaders costing $350 to $400 more! Write for complete information. The Baker-Raulang Company, 1223 W. 80th St., Cleveland 2, Ohio.

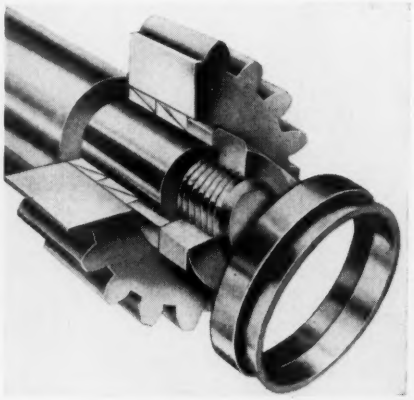
Baker
HANDLING EQUIPMENT

5582

manufacturer, the fuel system remains clean because all the oil is consumed at peak atomization efficiency.

For More Details Circle No. 46—Page 245

Fastener: U. S. Automatic Corp., Amherst, O.—Fastener device offers a means of fastening hubs onto a shaft without use of splines or keyways. Device is wedged between hub and shaft under hand pressure. Outer ring expands and the inner ring contracts. As full strength of both hub



and shaft is used, the unit is said to transmit the maximum torque for a given shaft diameter. Assembly consists of a straight cylindrical shaft and hub bore, eliminating all stress concentrations, permitting liberal tolerances on simple cylindrical surfaces.

For More Details Circle No. 47—Page 245

Thermostat: Burling Instrument Co., 16 River Rd., Chatham, N. J.—Differential expansion thermostat has a range of 35 to 600° F and is said to be capable of controlling temperatures to within ±½° F in liquids and ±1° F in air. Stainless steel sensing element is ¼ in. OD x 6 in. long. Control is obtained by the differential expansion of a rod within a tube, actuating a snap-action switch rated at 15 amp, 125-250 v ac.

For More Details Circle No. 48—Page 245

Drum Handler: Marvel Industries Inc., 2224 Cleveland St., Evanston, Ill.—Drum handling attachment for hand propelled fork trucks and portable stackers having removable forks or platforms, reportedly will handle any drum, open or closed, fibre or steel, regardless of diameter or height, and has a capacity rating of 1000 lb. Unit permits transportation, storage and tiering without pallets.

For More Details Circle No. 49—Page 245

Chemical Solutions: Chicago Apparatus Co., 1735 North Ashland Ave., Chicago 22, Ill.—"Ready-mix" standard solutions for use in industrial and scientific laboratories are

Why are U. S. Rubber grinding wheels chosen to grind Pearlitic Malleable Iron?

To grind gates from castings of Pearlitic Malleable Iron, the grinding must be done very quickly, at great pressures so that there is no time for excessive heat to build up. Not only must the wheel cut rapidly and cool, but also it should be wear-resistant to provide economy. Special tailor-made wheels by United States Rubber Company are the only wheels which this foundry has found suitable for the job.

YOU GET AN EXTRA DIVIDEND when you consult a "U.S." grinding wheel technician. It is his sole full-time job to make sure you get the right wheel for your particular needs. He is backed by all the technical resources and research data of United States Rubber Company.

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Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

guaranteed to be accurate within one part in 1000. Solutions are used as reference solutions for testing chemical formulas. According to the manufacturer, any type of solution for a particular need can be developed.

For More Details Circle No. 50—Page 245

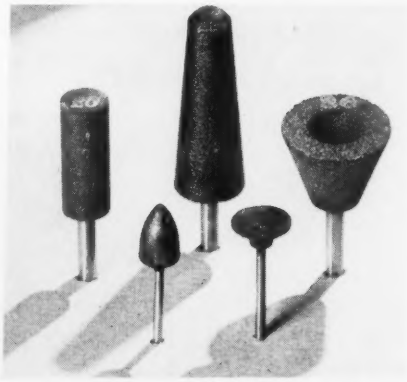
All-Purpose Paint: Wooster Sealkote Co., Wooster, O.—One-coat vinyl plastic all-purpose paint, suitable for interior and exterior applications, can be applied to either wet or dry surfaces, according to the manufacturer. Paint is said to resist mild industrial acids, alkalis, grease, oil, fats and dirt. It reportedly will not blister, crack, chalk, chip or peel in extremes of heat and cold. Paint can be applied with brush, roller or spray gun with no special surface preparation or primer being required.

For More Details Circle No. 51—Page 245

Conveyor Units: Lamson Corp., Syracuse 1, N. Y.—Pre-engineered conveyor systems include light-duty wheel gravity as well as medium and heavy duty roller gravity conveyor sections in all standard widths to make units flexible to fit new products, production schedules or building changes.

For More Details Circle No. 52—Page 245

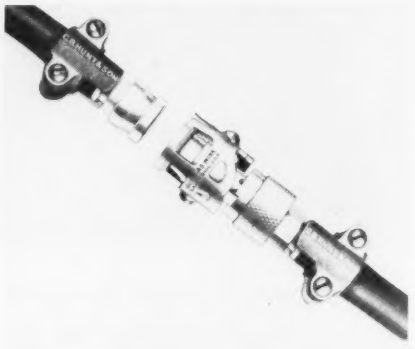
Resin-Bonded Wheels: American Diamond Saw Sales, 120 North West Ninth Ave., Portland 9, Oreg.—High-speed resin-bonded wheels and



points are designed to operate at 20,000 rpm and above. Aluminum-oxide-grain mounted wheels are coded to indicate the degree of hardness of the bond and are available in standard grits from 24 to 100 and sizes and shapes to conform to national standards.

For More Details Circle No. 53—Page 245

Valve Coupling: C. B. Hunt & Son Inc., Salem, O.—Detachable valve coupling locks in either "on" or "off and exhaust" positions and gives operator complete control of air line. It is designed to permit



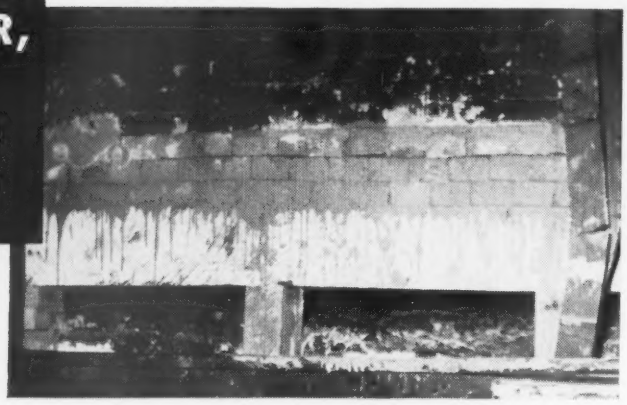
line air to be shut off and tools changed quickly, easily and safely at any point. Couplings are available in ¼, ⅜, ½ and ¾-in. sizes for line air up to 250 psi. Any size valve half can be connected to any size connection half.

For More Details Circle No. 54—Page 245

Lightweight Hose: Flexaust Co., 100 Park Ave., New York 17, N. Y.—To protect and reduce exterior from contact with rough and abrasive surfaces, the company's hoses and retractable ducts made of coated fabrics and spiral wire reinforcements are available with an added vinyl

ELIMINATE FORGE FURNACE WORK OPENING PROBLEMS WITH WALSH CSR, Cast Sillimanite Refractory

Planned with greater service life in mind! Before and after views of typical installation of Walsh CSR in slot type forging furnace.



HERE'S HOW!

CSR Gives You:

- Extra High Mechanical Strength
- Unusual Resistance to High Temperatures
- Highest Resistance to Thermal Shock
- Ease of Installation—and you get the
- Same Slot Height over the Entire Work Opening

Other money-saving Walsh products . . . Walsh Warco XX and Mullitex Fire Brick, Super Plastic and Refractory Castables for furnace linings. Write for details.

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For over 60 years manufacturers of high grade refractories

wearstrip bonded to the reinforcement where hose is most exposed to abrasion and damage. Wearstrip is available for hoses through 12 in. ID and for ducts in sizes 3 in. through 36 in. ID.

For More Details Circle No. 55—Page 245

Moisture Discharge: Wilkerson Corp., 3367 South Platte River Drive, Englewood, Colo.—Series of moisture discharging separators for compressed air equipment operate between 10 and 250 psi. Four models are offered, serving ¼ to ½-in. lines.

For More Details Circle No. 56—Page 245

Regulators: K-G Equipment Co., P. O. Box 538, Allentown, Pa.—Single and two-stage regulators for most

compressed gases contain a patented gage guard with positive spring lock action to protect the gage from accidental breakage. All internal parts are stainless steel. Pressure adjustment is made by a completely enclosed thrust bearing, integral with the adjusting mechanism. A filtered check valve seat unit is said to eliminate the basic causes of regulator seat failure by protecting the precision internal parts.

For More Details Circle No. 57—Page 245

Dust Collector: Torit Mfg. Co., 287 Walnut St., St. Paul 2, Minn.—Cyclone dust collector features six throw-away filters as part of an after-filter mechanism used to collect dust, lint, chips, powders and fumes in industrial plants. Filtered air is recirculated to help reduce heat loss. A 5-hp, 3450-rpm motor pulls 2100 cfm through an 8-in. outlet at a static pressure of 3.0 in. (water) and an air speed of more than 60 mph.

For More Details Circle No. 58—Page 245

Ice Melter: Speco Inc., 7308 Associate Ave., Cleveland 9, O.—Activated ice and snow-melting chemical pellets reportedly have 30 times the thawing capacity of salt. Light sprinkling on slippery surfaces is said to remove ice and snow without harming vegetation, rubber, asphalt and paved surfaces. Material is sup-

For protection in the foundry...

JAXCOLITE!*

We don't imagine there has ever been a safety material devised that is so right for foundry use as Jaxcolite-coated asbestos, duck or burlap.

Jaxcolite is a new compound. It has been thoroughly tested, proved and approved. Applied to the materials mentioned above, *it provides exceptional* resistance to molten metal splash, to heat, to burn, to the strongest acids and caustics, and of course to oil and water. Yet it wears well, it is flexible, lightweight and comfortable. Its cost is low. And the amazing thing is that people who use it simply refuse to buy anything else.

Steel-Grip makes a complete line of safety apparel made from Jaxcolite materials. The list is shown on this page. We earnestly urge you to send for trial swatches of this material and make any tests you want. It may prove to be *THE* answer to safety problems long unsolved. Send today.

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1. Amazing Jaxcolite Coated Materials are made up into Steel-Grip guaranteed quality safety apparel, VIZ:

Coats — Sleeves
Pants — Leggings
Aprons — Spats
Gloves and Mitts with Jaxcolite backs
Curtains

Send for trial garment and prove its superiority for yourself.

2. *We manufacture a complete line of safety apparel for every need, in leather, duck, Perma-Proof materials, asbestos, wool, Dynel cloth, Jaxcolite coated materials, aluminum coated materials, etc. These garments reflect in their materials, design and manufacture the high quality standards that have made Steel-Grip the outstanding supplier in the United States. Write for a catalog.*

TO BE SURE OF THE GENUINE, DEMAND THIS TRADE-MARK

PUZZLED by a dust problem?

Pangborn can solve it for you!

Pangborn Unit Dust Collectors give thorough, efficient dust control at any individual operation. Requiring little floor space, they can be located anywhere. Use the Pangborn Dust Collector to:

- *Reclaim valuable material*
- *Cut plant housekeeping costs*
- *Reduce dust damage to expensive machinery and finished products*
- *Speed production—improve working conditions*

Investigate Pangborn Unit Dust Collectors now! Shipped assembled . . . $545 and up. For details, write: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control and Blast Cleaning Equipment.*

Pangborn CONTROLS DUST

plied in 10-lb cans, 25-lb pails, 100, 200, 300 and 500-lb drums. Ton lots are shipped in 100-lb waterproof bags.

For More Details Circle No. 59—Page 245

Limit Switch: Micro Switch, Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill.—Low-force, heavy-duty limit switch is for use on counting devices or similar applications which require heavy-duty switches with light operating force. Two contact arrangements can be provided, single-pole double-throw and a two-circuit break. Both are listed for 10 amp at 120, 240 and 480 v.

For More Details Circle No. 60—Page 245

Paper Wipers: Scott Paper Co., Chester, Pa.—Disposable paper wiper contains thousands of minute perforations to accelerate absorption of liquids, provide cleaning action and maximum dirt retention. Chemical treatment creates wet strength. Wipers are packaged in boxes of 125 with each box containing a pop-up feature that makes a wiper available the instant one has been removed from the container.

For More Details Circle No. 61—Page 245

Fork Trucks: Baker-Raulang Co., 1223 West 80th St., Cleveland 2, O.—Line of electric fork trucks with 3000, 4000 and 6000 lb capacities are designed for high maneuverability, ease of maintenance and increased operator comfort and convenience. Turning radius for the 3000-lb truck is 73½ in., minimum intersecting aisle is 66½ in., and clearance for right angle turn is 87 in. exclusive of load length.

For More Details Circle No. 62—Page 245

Truck Leveler: Rowe Methods Inc., 2534 Detroit Ave., Cleveland 13, O.—Truck leveling device is designed to save dock space and is used where conventional dock leveling devices cannot be used. Unit is built into pavement in front of loading dock, and by means of a heavy duty hydraulic system, raises or lowers an over-the-road truck or trailer until the bed of the vehicle is even with the dock.

For More Details Circle No. 63—Page 245

Band Saw: Porter - Cable Machine Co., 59 Exchange St., Syracuse 8, N. Y. — High-speed steel blade for portable electric band saw cuts through such tough metals as stainless steel, carbon tool steel, nickel and high-speed tool steel. Band speed is 240 sfpm under load. Saw design enables it to cut rectangular stock up to 3¼ x 4¼ in., or round stock up to 3¼ in. in diam.

For More Details Circle No. 64—Page 245

How an Executive's Time Can Be Used Efficiently

A Method for Beating The Shortage of Time

By William Oncken Jr.*

AN EXECUTIVE is paid for the effective way in which he uses time. Yet no executive, whether in government or industry, has enough time in his day. Let's consider that you are a typical executive and see how your day is made up.

Of the tasks which come to your desk, the first group—and first for good reasons, too—is made up of those handed to you by your boss. Those get done right away, with no argument or postponement. You may find a memo on your desk, initialed in a soft pencil with your boss' sprawling signature.

Or your phone may ring while you are in the middle of your favorite business magazine. The boss says: "George, I'd like you to pull together the cost figures on our current model, and check it against our costs last year."

Or if he is a very informal guy, he'll catch you at the coffee break and start to chat about turnover. "I had an idea while I was shaving this morning, George. Do you think there could be any relationship between the rate of turnover in a crew and the number of the supervisor's children. You know, family men knowing more about handling people, or something like that. Why don't you run a check on it by tomorrow morning?"

It may be a scatter-brained idea, and you know right away that there's nothing in it, but you don't argue about it. Not too much, anyway. It gets done, and on top priority, because after all, he's the boss.

Next comes the system-imposed tasks. These aren't quite the same as the boss-imposed ones, but close to it. They are impersonal and overwhelming, but they have to be done, just because you are a part of the system. I once knew a man who had been hired as "special assistant to the vice-president," but neither he nor his vice-president knew what his duties were. His first assignment was to draw up his own job description.

But, of course, he got listed in the phone directory, and his name was painted on his door, along with his title, and even got added to the

*Chief, Training and Development Division, Office of Civilian Personnel, Department of the Army. Mr. Oncken also is a lecturer at George Washington University.

HAULS 2000 LBS.

With a Kwik-Mix R-15 Moto-Bug in your foundry, you can haul 1-ton loads of sand, scrap, slag, cores, flasks, small castings with one-man economy. It climbs 16% ramps fully loaded — has 550-lb. drawbar pull for towing wagons, carts. Turning radius is only 80 inches, overall width 35 inches. There's 18-to-1 gear reduction ratio on easy-handling steering wheel, full power forward and reverse. Gravity-dump hopper body available in 2 sizes —15 and 18 cu. ft. (optional). Hopper is interchangeable with 4½-ft. platform, and fork lift attachment.

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For lighter work, there's a low-cost S-10 Moto-Bug also available with multiple attachments. Get complete details from your Kwik-Mix distributor, or send for bulletin.

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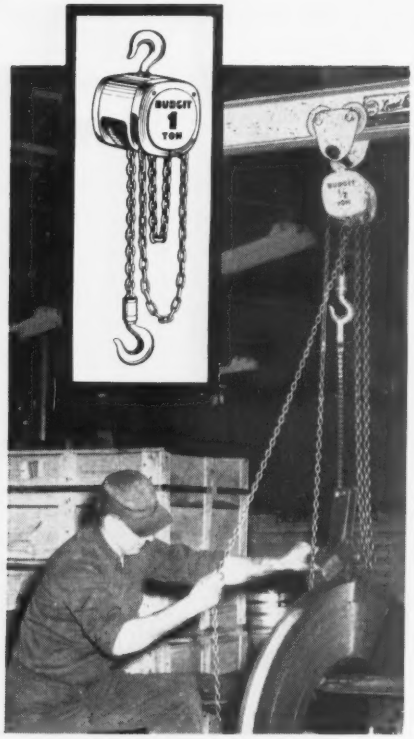

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organization chart, in a little box dangling from his boss' box. So automatically he got things to do. Memos found their way to his desk. Nobody was sure just what he was supposed to be informed of, so just to be sure, everybody added his name to the mailing list. Invitations to conferences and committee meetings began to come in, and before two weeks had passed, he was so busy that he had no time to find out what he should be doing.

This is the way system-imposed tasks grow, like cancerous tissue. You will have reports to read, comments to make, conferences to attend, data sheets to fill in and other routine—but necessary—assignments. With them and the boss-imposed tasks, your time easily can be filled, and then some, without getting ahead of yourself, or even keeping up.

Now comes the real meat of your job—your self-imposed tasks. These are things you think up for yourself to do. These are your real and individual contributions as an executive. If you are to be worth one-tenth of your salary, this is what you really have been hired to do. More than that, these are the things that give a job character, that make it fun. Almost everything else you do can be done by an intelligent clerk, but these are the province of a top executive like yourself. And you have no time for them!

How Creative Ideas Start

Let's see how some of these creative ideas get started. They seem to come at all hours of the day, as often as not when you are away from your desk. While shaving, while waiting to fall asleep, after falling asleep, while driving to work, in the middle of a report by your wife on her shopping trip. If you are methodical, you will immediately pull out your little black notebook, and write a short letter to yourself. If you are only partly methodical, like me, you jot a private kind of memo on any scrap of paper available. Later you expect to transfer these notes to something more substantial.

Perhaps you put them on a 3 x 5 slip of paper when you get to your desk, but you don't want to lose them, or push them aside, since each of them is a hot idea. Keep them up front: spear them on the end of your desk pen.

In come the day's letters to be signed, and you need that pen. You have to do something with the notes, so why not transfer them to your desk calendar. A couple tomorrow, the others at later dates, so you'll really be able to do something about

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them when they come up. Might as well be realistic, mightn't one?

The next morning, there is that hot idea staring you in the face. Can't get at it right away, but all it takes is diligence. A couple of hours for the boss, a couple of hours for the system, a short lunch, and the rest of the day to be creative. Easy as pie!

But just as you get started, the boss' secretary calls you and passes on the word that you are to substitute for him at a meeting. You can bring nothing to the meeting, can take away little more, but it is a boss-imposed task, and off you go. You get back at lunch time, 'way off your schedule, and are just about to make up time by working while you have a sandwich at your desk. You pick up your phone to order, and the boss pokes his head in the door. "How about lunch, George?" Another boss-imposed task —another must—a longer lunch than usual.

The afternoon is devoted to taking care of those jobs that were originally on your morning schedule, and you get no chance to be creative, to do anything on those special tasks. The slips get transferred to the next day, when you'll try again.

The next day is no better, and your little notes keep getting transferred. Before you realize it, you've begun to catch up with those ideas that were put way ahead, to give you a chance to catch up. Pretty soon there are twelve projects on your list, each of them a brilliant contribution to the efficiency of the office, if only you could get some time to work it out.

At this point, the best thing to do is to take a three-week vacation. Go to Florida or the Maine woods, but go. Forget about the office routine, and don't give those twelve items another thought. When you get back, look at them, one at a time. Of the twelve, six will sound like gibberish, with no relationship to anything. Your abbreviations, once so crystal clear, will have lost all meaning. Of the other six, you won't understand why three ever held any promise at all, because they will seem fantastic and impossible. The last three still will be solid suggestions, and with only three and your vigorous post-vacation glow you should be able to get at them and do something about them.

But perhaps you are in the exceptional position—like the majority of us—of not being able to take three weeks off whenever you feel you need it. What then? Getting away enabled you to become a little more

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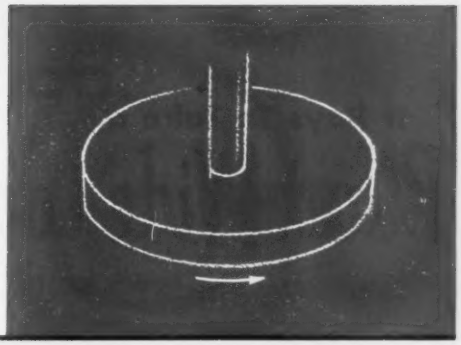

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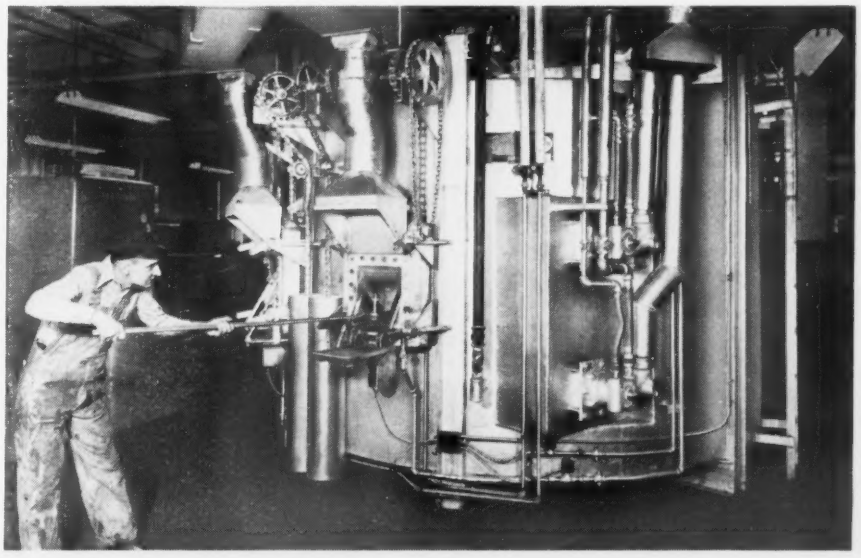

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May we tell you more about the "weighing system plan"—and its application to your requirements? Write to . . . Toledo Scale Company, Toledo 1, Ohio.

objective about those precious brain-children of yours. It enabled you to look at your own ideas with a little more objectivity. Here is a method which will force you to become objective. It may not be as refreshing as a vacation, but it will permit a better evaluation of an idea.

On the top of a legal pad, write a full description of your idea. Not just a brief title, nor a meaningless phrase like "a new method of handling inquiries," but a detailed explanation, so that anybody else in the office would know what you are driving at.

Now answer four questions, or groups of questions, about your idea. Each should be answered in a full 250 words. Don't skimp on the answer, or say that there is no point in writing that much. If you can't say 250 words about it, take it as a sign that you are not ready to get to work on the proposal. The questions are not very complicated.

> What is the current status of the problem;
> Is anybody besides me worried about it?
>
> What's wrong with the way it is now?
> Why should I be concerned with it?
>
> What will it be like if my plan is adopted?
> Will it make any difference to anybody?
>
> What will it be like if my plan is thrown out?
> Will the business survive?
> Can we go on this way?

Remember, a full 250 words on each. As you go through the questions, you will be unable to put down a good answer to one of the questions and will have to put that idea aside. Of your twelve ideas, chances are that you will end up with only three. And while there is no possible way of proving this, I feel certain that these would be the very three that would still look good to you after that vacation.

But all that we have done is to eliminate the weak sisters. We still haven't done anything about making time to carry them out. Sure, you may be a little more certain that you've got something, but you still need that time. So to mix metaphors, you're at a dead end and you must lift yourself by your own bootstraps.

Since you are an executive, you are bound to have at least one assistant. She may be a secretary, but for the moment, call her an administrative assistant. If there is a choice, select that member of your staff who is making the least contribution to the office. Whatever you get out of

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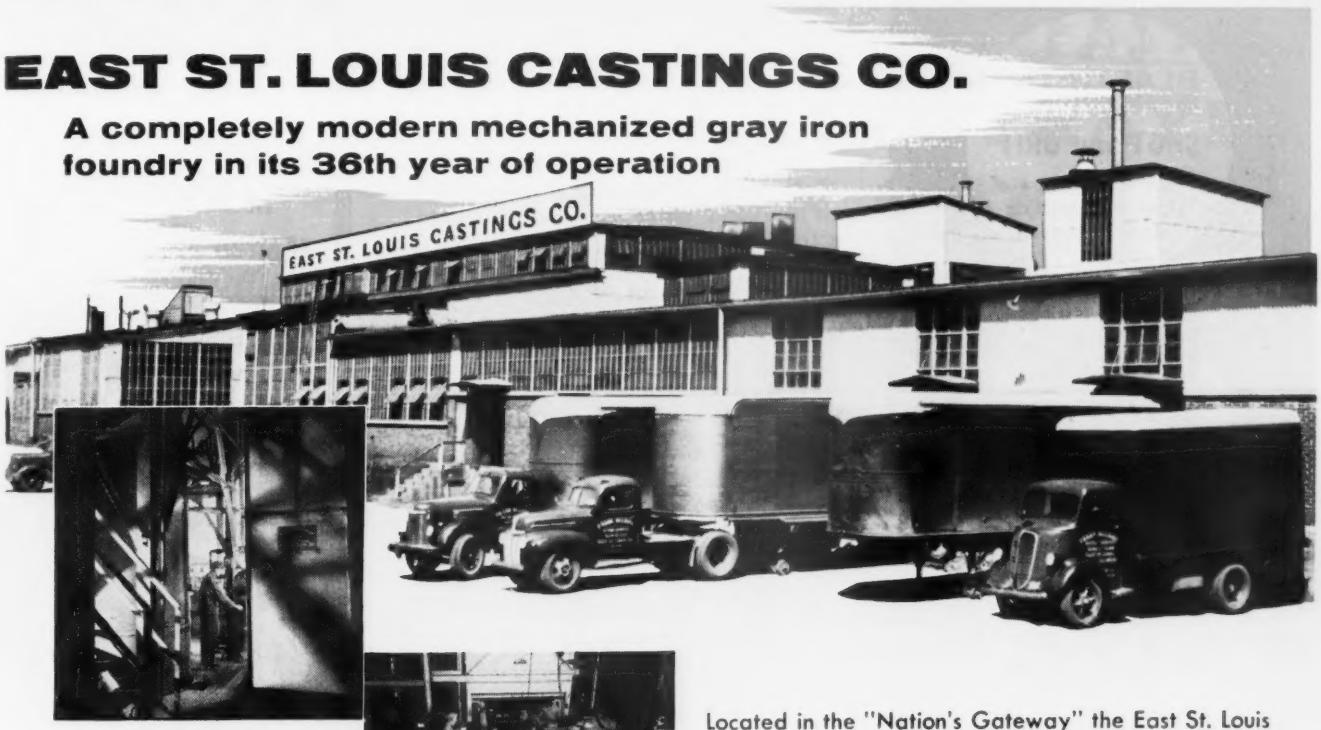
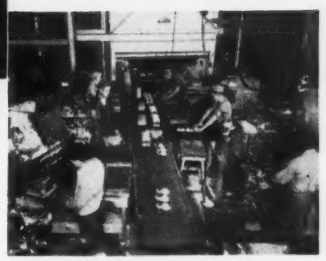


Modern sand handling and conditioning unit delivers sand custom tailored for a particular job. Close sand control results in high product uniformity, quality and economy.



A thoroughly mechanized core room accounts for high production level. Core benches on each side of the conveyor facilitate core movement to a gas fired tower oven.

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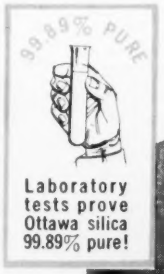

The East St. Louis Castings Co. is a satisfied user of Ottawa Silica sands. Through the facilities of *Midvale Mining* and *Mfg. Co.*, Ottawa's distributor, these superior silica products contribute greatly to the over-all quality of the foundry products which emanate from the East St. Louis Castings Co. plant. To retain this customer-distributor approval, Ottawa Silica Company will continue to apply every facility in maintaining the highest standards in the silica industry.

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him is that much to the good. Also, you really don't expect him to add anything except his presence; you will still have to do the real thinking. His function is to allow you to think.

First you explain the problem to him, carefully, clearly, slowly. On a long pad write ORIGINAL DISCUSSION on the top, with the date of your meeting alongside it. Then down at the bottom write PLAN PUT INTO EFFECT. Let him put down the intermediate steps, and assign a date for each. Put down another appointment for him to report to you, and jot it down on your calendar. Now what is the situation? Your self-imposed task has changed into two things: a definite date on your calendar, which is akin to a system-imposed task, and your assistant has a boss-imposed task. And you remember what happens to boss-imposed tasks?

So on the appointed date, he reports with an outline. It's not very good, perhaps; there are some steps left out; some are fuzzy; some are in the wrong order. But it *is* an outline, and that's more than you got done by yourself, isn't it? You discuss the faults and make suggestions. Give him a new appointment, a week or ten days later.

This project will move slowly, but it will move ahead, week by week. Keep adjusting the deadlines for each step as you go along. Gradually, your project will get started and at the same time, you may even be educating an assistant.

If you have neither an assistant, nor a secretary whom you can treat like one, your only recourse is to develop a split personality. This is harder to do, and it will take a little longer, but speak sharply to yourself, and you will be able to follow the same procedure.

Carry this technique through consistently for a while, and you will begin to see results. Use the method to cut down the time spent on system-imposed tasks, for these are the voracious consumers of executive time. If you meet with success along this channel, it will pay double dividends. Success here will give you more time to work on your self-imposed tasks. And these are what give a job its character and make it fun. A job that is fun is less tiring, and the benefits begin to accumulate in geometric proportion.

The hardest part of this plan is taking the first step. It is sitting down and answering the four questions in the required detail about any one of your numerous ideas. I have trouble squeezing this into my schedule. Usually I do it on my vacation!

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Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"An Exact Science?"

WHETHER we ever shall be able to reduce foundry practice to an exact science is a moot question. We certainly are a long way from it in the jobbing shop, as we are reminded daily by the variety of ever-present problems. Despite all the very careful tests and records of laboratories, our present knowledge of the hot strength factor, for example, surely is not dependable.

Among others, Harry W. Dietert has devoted a great deal of time and attention to the study of "core collapsibility control," and he has produced facts and figures which I certainly will not question. His listing of the order in which certain binders and other additives collapse, is, I believe, generally accepted as quite reliable. But many unmeasurable conditions affect core behavior about which Mr. Dietert's findings become only indicative—only a first step in our attempt to provide exactly the right properties for a given job.

For instance, a 1-in. stock-core in an 8-in. bushing cast perpendicularly is one thing; the same bushing cast horizontally is quite another. A jacket core in an automotive cylinder-block, with hardly more than ½-in. of metal around it, presents yet another problem, and it often proves to be a very difficult one. Type of metal, time and temperature of pouring, venting facilities, shape of casting and gating method all must be considered carefully before we even begin to plan our core mix.

Using all of the information at our command, we still have imponderables with which to deal. The time of collapse of certain cores is measured in seconds. This, of course, is done under controlled conditions, observable, which the foundryman never enjoys. Though he tries to be guided by laboratory findings, he must still rely on empiric knowledge

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to achieve even moderate success.

A Dry Core—Next we come to the question, "When is a core dry?" Is there any way of knowing precisely? If so, I haven't learned of it. Most authorities agree that color is a poor indicator and that the hardness test is inadequate. Are we turning to resin binders because of an uncertainty with other materials? And then again, are we any safer with resin than with oil? Most of us believe that when a core is thoroughly dry, it does what we want it to do. Yet under normal production baking conditions do we ever get a core completely dry? I doubt it!

In one experiment, a core high in oil and silica flour had every indication of being baked after 36 hr in the oven, yet it gave trouble in the mold. When a similar core was baked 90 hr, results were entirely satisfactory. What happened between 36 and 90 hr that our instruments failed to detect?

Of course, it is not always necessary that a core should be completely baked in order to fulfill its function. Just as the skin-drying of a mold will sometimes serve as well as oven-drying, so a green-centered core can produce a good casting if that core is mostly print and the metal sets quickly.

I have observed large castings in which impinging metal from the gates obviously had cut into the core from ½ to 3 in. deep, sending the burnt sand to other parts of the mold. Yet these cores all appeared to be well baked. They were even torched, as an extra precaution, prior to the closing of the mold. Was our trouble due to over-baked cores, to the absorption of atmospheric moisture between baking and pouring or to incomplete baking in the first place? I am inclined to the latter belief.

Of course, our first inclination was to attribute the damage to low hot strength and a too-rapid core collapse; but other cores from the same mix sustained similar torture without failure. If our trouble is due to underbaked cores, anything we add to increase hot strength will only aggravate the condition. I do, however, feel that in most cases we are working our core mixes too wet and that a reduction of as much as 1 per cent of moisture would save castings that are otherwise doomed. It might also eliminate some of the core sag of which we complain.

Hot Sand—I have never met a foundryman who preferred to work with hot sand. I have met many who would scream to high heaven if their sand was even slightly warm. Sand that behaves perfectly when cold often causes no end of trouble when hot. In many shops, the hot-sand problem is something one simply has to live with, and the only answer seems to be heated patterns.

I have yet to see rapid sand cooling that was entirely satisfactory, but I do expect to see it one of these days since many people are working toward that end. When shakeout sand is broken down to the point where each individual grain is exposed to the cooling action of repeated aeration, then, I believe, the victory will be won!

Sand Aging—It is said that good whiskey, books and friends improve with age. I believe that to some extent this principle is true of molding sand. However intangible, there is some sort of a change that occurs in the properties of a sand mix after it has aged a couple of days. I have thus far been unable to detect or register this change by any of my lab tests, but the improved moldability of such a sand is un-

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Johns-Manville TRANSITE CORE PLATES AND SLIP JACKETS

deniable. Few foundries have capacity to stock and preserve prepared sand to obtain the benefits of aging, but it is something for all of us to think about.

There are, of course, many imponderables in sand practice, most of which will undoubtedly lose their mystery as our knowledge of the subject is broadened. It is this thought that should provide an unfailing inspiration to the sandman, for the dawn of a tomorrow may bring him a magic "stabilizer" or even a more magic understanding of the whys and wherefores of sand behavior. Like a prospector who is exploring virgin ground, he thrills to the excitement of a potential discovery!

How should he correct his usage of the materials now available? How will pH control affect the properties of his present mix? These, and many, many other questions demand answers that the patient, inquiring sandman will contribute to the foundry practice of tomorrow.

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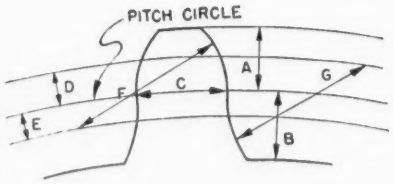
Information on Laying Out Epicycloidal Gear Teeth



A = 0.3 x pitch = distance between the pitch and addendum circles.

B = 0.375 x pitch = distance between pitch and root circles.

C = 0.466 x pitch = thickness of gear tooth.

D = distance from pitch circle to line of flank centers.

E = distance from pitch circle to radius base line.

F = face radius of gear tooth.

G = flank radius of gear tooth.

Table I

Values for Layout of 12-Tooth Gear

Pitch	A	B	C	D*	E	F	G*
½	5/32	3/16	15/64	..	1/64	5/16	..
¾	7/32	9/32	11/32	..	1/64	31/64	..
1	5/16	3/8	15/32	..	1/32	41/64	..
1⅛	11/32	27/64	17/32	..	1/32	23/32	..
1¼	3/8	15/32	31/64	..	1/32	13/16	..
1⅜	13/32	33/64	41/64	..	1/32	7/8	..
1½	7/16	9/16	11/16	..	1/32	31/32	..
1⅝	½	5/8	¾	..	1/32	1 1/64	..
1¾	17/32	31/32	13/16	..	1/32	1 1/8	..
1⅞	9/16	45/64	7/8	..	1/32	1 3/16	..
2	19/32	¾	15/16	..	1/64	1 9/32	..
2¼	43/64	27/32	1 3/64	..	3/64	1 7/16	..
2½	¾	15/16	1 5/32	..	1/64	1 39/64	..
2¾	53/64	1 1/32	1 9/32	..	3/64	1¾	..
3	29/32	1⅛	1 13/32	..	1/16	1 51/64	..
3¼	31/32	1 7/32	1 33/64	..	1/16	2 3/32	..
3½	1 3/64	1 5/16	1 5/32	..	1/64	2¼	..
4	1 13/64	1½	1 55/64	..	1/64	2 9/16	..

Table II

Values for Layout of 13-14-Tooth Gear

Pitch	A	B	C	D	E	F	G
½	5/32	3/16	15/64	1½	1/64	3/8	2 13/32
¾	7/32	9/32	11/32	2¼	1/64	½	3 5/8
1	5/16	3/8	15/32	3	1/32	21/32	4 13/16
1⅛	11/32	27/64	17/32	3 3/8	1/32	¾	5 13/32
1¼	3/8	15/32	31/64	3¾	1/32	13/16	6
1⅜	13/32	33/64	41/64	4 1/8	1/32	29/32	6 5/8
1½	7/16	9/16	11/16	4½	1/32	31/32	7 13/16
1⅝	½	5/8	¾	4⅞	1/32	1 1/16	7 5/8
1¾	17/32	31/32	13/16	5¼	1/32	1 3/64	8 13/32
1⅞	9/16	45/64	7/8	5⅝	1/64	1 13/64	9
2	19/32	¾	15/16	6	1/64	1 1/16	9 5/8
2¼	43/64	27/32	1 3/64	6¾	1/64	1 15/64	10 15/16
2½	¾	15/16	1 5/32	7½	1/64	1 5/8	12
2¾	53/64	1 1/32	1 9/32	8¼	1/64	1 25/64	13 7/32
3	29/32	1⅛	1 13/32	9	1/16	1 31/64	14 13/32
3¼	31/32	1 7/16	1 33/64	9¾	1/16	2⅛	15 5/8
3½	1 1/64	1 5/16	1 5/8	10½	1/16	2 3/32	16 13/32
4	1 13/64	1½	1 55/64	12	1/64	2 29/64	19 3/16

*In this chart for 12 teeth only, the dimensions D and G are omitted as the flanks may be formed with sufficient accuracy from the radii given for the face.

Table III

Values for Layout of 15-16-Tooth Gear

Pitch	A	B	C	D	E	F	G
½	5/32	3/16	15/64	9/16	1/64	11/32	1¼
¾	7/32	9/32	11/32	27/32	1/32	½	1⅞
1	5/16	3/8	15/32	1 3/32	1/32	43/64	2½
1⅛	11/32	27/64	17/32	1 15/32	1/32	¾	2 13/16
1¼	3/8	15/32	31/64	1⅜	1/32	53/64	3⅛
1⅜	13/32	33/64	41/64	1 31/32	1/64	⅞	3 7/16
1½	7/16	9/16	11/16	1 23/32	1/64	1	3¾
1⅝	½	5/8	¾	1 7/8	1/64	1 3/32	4 1/16
1¾	17/32	31/32	13/16	1 15/16	1/16	1 11/64	4⅜
1⅞	9/16	45/64	⅞	2 1/16	1/16	1¼	4 11/16
2	19/32	¾	15/16	2 3/16	1/16	1 1/2	5
2¼	43/64	27/32	1 3/64	2 5/8	1/16	1½	5⅝
2½	¾	15/16	1 5/32	2¾	1/64	1 43/64	6¼
2¾	53/64	1 1/32	1 9/32	3 1/32	1/64	1 57/64	6⅞
3	29/32	1⅛	1 13/32	3 5/16	1/32	2 1/64	7½
3¼	31/32	1 9/32	1 33/64	3 9/16	1/64	2 3/16	8⅛
3½	1 3/64	1 5/16	1 5/8	3⅞	1/64	2 1/32	8¾
4	1 13/64	1½	1 55/64	4 1/32	1/8	2 11/16	10

Table IV

Values for Layout of 17-18-Tooth Gear

Pitch	A	B	C	D	E	F	G
½	5/32	13/64	15/64	23/64	1/64	11/32	31/32
¾	7/32	9/32	11/32	1 7/32	1/32	43/64	1 15/32
1	5/16	⅜	15/32	1 15/32	1/64	11/16	1 31/64
1⅛	11/32	27/64	17/32	1 31/32	1/64	25/32	2 1/16
1¼	3/8	15/32	31/64	⅞	3/64	55/64	2 7/16
1⅜	13/32	33/64	41/64	2 3/32	1/64	15/16	2 13/16
1½	7/16	9/16	11/16	1 11/16	1/16	1 3/32	2 13/16
1⅝	½	5/8	¾	1 1/8	1/16	1 7/64	3 7/64
1¾	17/32	31/32	13/16	1 7/32	1/64	1⅛	3 7/16
1⅞	9/16	45/64	⅞	1 5/16	1/64	1¼	3 31/32
2	19/32	¾	15/16	1 13/32	1/64	1 23/32	3 29/32
2¼	43/64	27/32	1 3/64	1 27/32	1/32	1 17/32	4 1/8
2½	¾	15/16	1 5/32	1¾	1/64	1 55/64	4 7/8
2¾	53/64	1 1/32	1 9/32	1 31/32	1/64	1⅞	5 3/8
3	29/32	1⅛	1 13/32	2 7/64	1/32	2 5/64	5 29/32
3¼	31/32	1 7/32	1 33/64	2 9/32	1/32	2 7/32	6 11/32
3½	1 3/64	1 5/16	1 5/8	2 21/64	1/64	2 3/8	6 23/32
4	1 13/64	1½	1 55/64	2 13/16	1/32	2 23/32	7 13/16

Table V

Values for Layout of 19-21-Tooth Gear

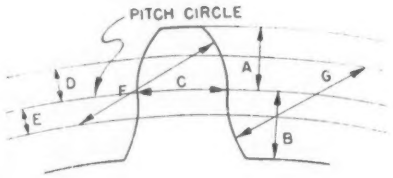
Pitch	A	B	C	D	E	F	G
½	5/32	3/16	15/64	¼	1/64	23/64	13/16
¾	7/32	9/32	11/32	3/8	1/32	17/32	1 7/32
1	5/16	3/8	15/32	½	1/64	45/64	1 5/8
1⅛	11/32	27/64	17/32	9/16	1/64	25/32	1 13/16
1¼	3/8	15/32	31/64	5/8	1/64	⅞	2 1/32
1⅜	13/32	33/64	41/64	¾	1/64	31/32	2¼
1½	7/16	9/16	11/16	¾	1/16	1 1/16	2 7/16
1⅝	½	5/8	¾	13/16	1/16	1 1/8	2 13/32
1¾	17/32	31/32	13/16	⅞	1/64	1 7/32	2 25/64
1⅞	9/16	45/64	⅞	15/16	1/64	1 5/16	3 5/32
2	19/32	¾	15/16	1	1/64	1 13/32	3 17/64
2¼	43/64	27/32	1 3/64	1 1/8	1/32	1 37/64	3 13/32
2½	¾	15/16	1 5/32	1¼	1/64	1¾	4 5/64
2¾	53/64	1 1/32	1 9/32	1 3/8	1/64	1 29/64	4 31/64
3	29/32	1⅛	1 13/32	1½	1/8	2 7/64	4 25/32
3¼	31/32	1 7/32	1 33/64	1 5/8	1/8	2 9/32	5 13/32
3½	1 3/64	1 5/16	1 5/8	1¾	3/64	2 29/64	5 33/64
4	1 13/64	1½	1 55/64	2	3/32	2 13/16	6 33/64

Table VI

Values for Layout of 22-24-Tooth Gear

Pitch	A	B	C	D	E	F	G
½	5/32	3/16	15/64	3/16	1/32	23/64	23/32
¾	7/32	9/32	11/32	17/32	1/32	35/64	1 1/64
1	5/16	⅜	15/32	23/32	1/64	47/64	1 1/16
1⅛	11/32	27/64	17/32	13/16	1/64	53/64	1 29/64
1¼	3/8	15/32	31/64	29/32	1/64	1 1/32	1 33/64
1⅜	13/32	33/64	41/64	31/32	1/64	1 9/64	1 41/64
1½	7/16	9/16	11/16	1 5/32	1/64	1 13/64	2 3/64
1⅝	½	5/8	¾	1 7/32	1/64	1 17/64	2 11/64
1¾	17/32	31/32	13/16	1 11/32	1/64	1 25/64	2 27/64
1⅞	9/16	45/64	⅞	1 15/32	1/64	1 33/64	2 35/64
2	19/32	¾	15/16	1 17/32	1/64	1 41/64	2 43/64
2¼	43/64	27/32	1 3/64	1 23/32	1/64	1 57/64	3 3/64
2½	¾	15/16	1 5/32	2 1/32	1/32	2 5/64	3 15/64
2¾	53/64	1 1/32	1 9/32	2 5/32	1/32	2 13/64	3 27/64
3	29/32	1⅛	1 13/32	2 9/32	1/32	2 21/64	3 39/64
3¼	31/32	1 7/32	1 33/64	2 13/32	1/32	2 29/64	4 3/64
3½	1 3/64	1 5/16	1 5/8	2 17/32	1/32	2 37/64	4 15/64
4	1 13/64	1½	1 55/64	2 25/32	1/32	2 53/64	5 3/64

Information on Laying Out Epicycloidal Gear Teeth



A = 0.3 x pitch = distance between the pitch and addendum circles.

B = 0.375 x pitch = distance between pitch and root circles.

C = 0.466 x pitch = thickness of gear tooth.

D = distance from pitch circle to line of flank centers.

E = distance from pitch circle to radius base line.

F = face radius of gear tooth.

G = flank radius of gear tooth.

Table VII

Values for Layout of 25-29-Tooth Gear

Pitch	A	B	C	D	E	F	G
½	5/32	3/16	15/64	9/64	1/32	3/8	31/32
¾	7/32	9/32	11/32	7/32	1/32	9/16	31/32
1	5/16	3/8	15/32	5/16	3/64	¾	1 5/16
1⅛	11/32	27/64	17/32	21/64	1/16	27/32	1 11/16
1¼	3/8	15/32	37/64	23/64	1/16	15/16	1 5/8
1⅜	13/32	33/64	41/64	13/32	1/16	1 1/64	1 23/32
1½	7/16	9/16	11/16	7/16	5/64	1 1/64	1 31/64
1⅝	½	5/8	¾	15/32	5/64	1 13/64	2 7/64
1¾	17/32	21/32	13/16	½	3/32	1 19/64	2 9/32
1⅞	9/16	23/32	7/8	33/64	3/32	1 29/64	2 7/16
2	19/32	¾	15/16	37/64	7/64	1 31/64	2 15/32
2¼	43/64	27/32	1 3/64	21/32	7/64	1 51/64	2 15/16
2½	¾	15/16	1 5/32	23/32	⅛	1 7/8	3¼
2¾	53/64	1 1/32	1 9/32	51/64	9/64	2 1/32	3 9/16
3	29/32	1⅛	1 13/32	⅞	5/32	2 7/32	3 29/32
3¼	31/32	1 7/32	1 33/64	15/16	5/32	2 13/32	4 7/32
3½	1 3/64	1 5/16	1 5/8	1 1/64	11/64	2 19/32	4 9/16
4	1 13/64	1½	1 55/64	1 5/32	13/64	2 31/32	5 13/64

Table VIII

Values for Layout of 30-36-Tooth Gear

Pitch	A	B	C	D	E	F	G
½	5/32	3/16	17/64	7/64	1/32	3/8	39/64
¾	7/32	9/32	1/2	11/64	1/64	9/16	39/64
1	5/16	3/8	15/32	15/64	1/16	49/64	1 1/8
1⅛	11/32	27/64	17/32	1/4	5/64	55/64	1 13/64
1¼	3/8	15/32	37/64	9/32	5/64	61/64	1½
1⅜	13/32	33/64	41/64	5/16	3/32	1 3/64	1 33/64
1½	7/16	9/16	11/16	11/32	3/32	1 7/64	1 41/64
1⅝	½	5/8	¾	3/8	3/32	1 1/8	1 61/64
1¾	17/32	21/32	13/16	13/32	7/64	1 11/32	2 1/64
1⅞	9/16	23/32	7/8	7/16	7/64	1 15/32	2 17/64
2	19/32	¾	15/16	15/32	⅛	1 17/32	2 33/64
2¼	43/64	27/32	1 3/64	33/64	9/64	1 33/32	2 49/64
2½	¾	15/16	1 5/32	37/64	5/32	1 29/32	3
2¾	53/64	1 1/32	1 9/32	5/8	5/32	2 3/32	3 1/64
3	29/32	1⅛	1 13/32	11/16	3/16	2 5/32	3 33/64
3¼	31/32	1 7/32	1 33/64	¾	13/64	2 25/32	4 1/64
3½	1 3/64	1 5/16	1 5/8	13/16	7/32	2 31/32	4 17/64
4	1 13/64	1½	1 55/64	59/64	15/64	3 3/64	4 13/16

*The dimensions here given may be used for any gear with 145 or more teeth or for a straight rack.

Table IX

Values for Layout of 37-38-Tooth Gear

Pitch	A	B	C	D	E	F	G
½	5/32	3/16	15/64	3/32	1/32	25/64	9/16
¾	7/32	9/32	11/32	3/32	1/32	13/32	9/16
1	5/16	3/8	15/32	13/64	5/64	51/64	1⅛
1⅛	11/32	27/64	17/32	7/32	5/64	57/64	1¼
1¼	3/8	15/32	37/64	1/4	3/32	1	1 13/32
1⅜	13/32	33/64	41/64	9/32	3/32	1 1/32	1 29/32
1½	7/16	9/16	11/16	19/64	7/64	1 3/16	1 11/16
1⅝	½	5/8	¾	21/64	7/64	1 5/32	1 23/32
1¾	17/32	21/32	13/16	11/32	⅛	1 3/8	1 31/32
1⅞	9/16	23/32	7/8	3/8	⅛	1 13/32	2 3/32
2	19/32	¾	15/16	13/32	9/64	1 13/32	2¼
2¼	43/64	27/32	1 3/64	29/64	5/32	1 53/64	2 17/32
2½	¾	15/16	1 5/32	½	11/64	1 31/32	2 31/64
2¾	53/64	1 1/32	1 9/32	33/64	11/64	2 11/64	3 5/64
3	29/32	1⅛	1 13/32	39/64	13/64	2 3/8	3 23/64
3¼	31/32	1 7/32	1 33/64	21/32	7/32	2 9/16	3 41/64
3½	1 3/64	1 5/16	1 5/8	45/64	15/64	2 3/4	3 59/64
4	1 13/64	1½	1 55/64	51/64	9/32	3 1/16	4½

Table X

Values for Layout of 49-72-Tooth Gear

Pitch	A	B	C	D	E	F	G
½	5/32	3/16	15/64	5/64	3/64	13/32	17/32
¾	7/32	9/32	11/32	1/8	1/64	5/8	31/64
1	5/16	3/8	15/32	1/8	1/64	27/32	1 1/16
1⅛	11/32	27/64	17/32	3/32	3/64	15/16	1 3/16
1¼	3/8	15/32	37/64	7/32	7/64	1 3/32	1 21/64
1⅜	13/32	33/64	41/64	5/32	5/64	1 7/64	1 13/32
1½	7/16	9/16	11/16	1/4	1/8	1 1/4	1 13/32
1⅝	½	5/8	¾	21/64	7/64	1 11/32	1 33/64
1¾	17/32	21/32	13/16	13/64	9/64	1 29/64	1 37/32
1⅞	9/16	23/32	7/8	5/16	3/32	1 5/16	2
2	19/32	¾	15/16	11/32	5/32	1 31/32	2⅛
2¼	43/64	27/32	1 3/64	23/64	11/64	1 7/8	2 3/8
2½	¾	15/16	1 5/32	27/64	13/64	2 5/64	2 11/32
2¾	53/64	1 1/32	1 9/32	15/32	15/64	2 9/32	2 29/32
3	29/32	1¼	1 13/32	33/64	1/4	2½	3 3/16
3¼	31/32	1 7/32	1 33/64	37/64	9/64	2 11/16	3 13/16
3½	1 3/64	1 5/16	1 5/8	19/32	5/32	2 29/32	3 33/32
4	1 13/64	1½	1 55/64	1/16	21/64	3 5/16	4¼

Table XI

Values for Layout of 73-144-Tooth Gear

Pitch	A	B	C	D	E	F	G
½	5/32	3/16	15/64	5/64	3/64	29/64	½
¾	7/32	9/32	11/32	7/64	1/16	43/64	¾
1	5/16	3/8	15/32	15/64	3/32	29/32	1
1⅛	11/32	27/64	17/32	5/32	7/64	1 1/64	1⅛
1¼	3/8	15/32	37/64	11/64	7/64	1 7/64	1¼
1⅜	13/32	33/64	41/64	3/16	⅛	1 15/64	1 3/8
1½	7/16	9/16	11/16	13/64	7/64	1 23/64	1½
1⅝	½	5/8	¾	15/64	9/64	1 15/32	1 5/8
1¾	17/32	21/32	13/16	¼	5/32	1 9/16	1¾
1⅞	9/16	23/32	7/8	17/64	11/64	1 11/16	1⅞
2	19/32	¾	15/16	9/32	⅛	1 11/16	2
2¼	43/64	27/32	1 3/64	5/16	13/64	2 1/32	2¼
2½	¾	15/16	1 5/32	37/64	5/32	2¼	2½
2¾	53/64	1 1/32	1 9/32	⅝	1/4	2 15/32	2¾
3	29/32	1⅛	1 13/32	27/64	17/64	2 45/64	3
3¼	31/32	1 7/32	1 33/64	29/64	19/64	2 59/64	3¼
3½	1 3/64	1 5/16	1 5/8	½	5/16	3 3/32	3½
4	1 13/64	1½	1 55/64	9/16	23/64	3 29/64	4

Table XII

Values for Layout of 145-Tooth Gear or Rack*

Pitch	A	B	C	D	E	F	G
½	5/32	3/16	15/64	1/16	3/64	15/32	15/32
¾	7/32	9/32	11/32	3/32	5/64	45/64	33/32
1	5/16	3/8	15/32	1/8	7/64	1/8	31/64
1⅛	11/32	27/64	17/32	9/64	7/64	1 3/64	1 1/16
1¼	3/8	15/32	37/64	5/32	1/8	1 3/32	1 3/16
1⅜	13/32	33/64	41/64	11/64	9/64	1 9/32	1 19/64
1½	7/16	9/16	11/16	3/16	5/32	1 33/64	1 27/64
1⅝	½	5/8	¾	13/64	5/32	1 33/64	1 35/64
1¾	17/32	21/32	13/16	7/32	11/64	1 5/8	1 43/32
1⅞	9/16	23/32	7/8	15/64	11/64	1 13/16	1 55/64
2	19/32	¾	15/16	1/4	13/64	1 37/64	1 39/64
2¼	43/64	27/32	1 3/64	9/32	7/32	2 3/32	2 9/64
2½	¾	15/16	1 5/32	19/64	1/4	2 21/64	2 5/8
2¾	53/64	1 1/32	1 9/32	21/64	9/32	2 35/64	2 39/64
3	29/32	1⅛	1 13/32	23/64	1/8	2 51/64	2 53/64
3¼	31/32	1 7/32	1 33/64	25/64	21/64	3 1/32	3 3/32
3½	1 3/64	1 5/16	1 5/8	27/64	23/64	3 1/4	3 31/64
4	1 13/64	1½	1 55/64	31/64	13/32	3 33/32	3 51/64

PROVED SUPERIOR

ACME RESIN

1 MULLING, tacky stage. Cold sand, liquid resin, and catalyst are charged into a standard muller.

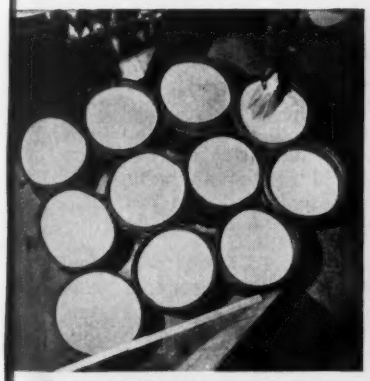
2 MULLING, free-flowing stage. Each grain of sand *uniformly coated* —no critical control necessary.

3 DISCHARGING. Sand is *dust-free*, cannot segregate from resin, green strength is controllable.

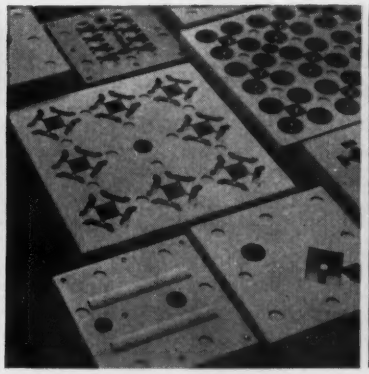
4 TWENTY-POWER magnification of resin-coated grains of sand after mulling process.

PlastiSand® PROCESS

Resin formulation and the coating process covered by Patents 2,706,163 *and* 2,706,188

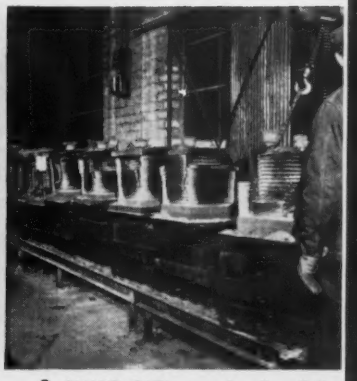


5 COATED SAND, ready for use. Extremely *high tensile strength* at resin contents of from 2% to 4%.



6 BLOWN SHELL CORES. *Non-segregating* qualities lend themselves perfectly to shell and core blowing techniques.

7 STACK POURING of Alnico magnets, 12 to 16 high. 2% of resin produces necessary *high strength*, saves time and space.



8 SHAKE OUT—good collapsibility makes for easier shake out and better cleanup.

Pictures courtesy Mr. Raymond Kelly, Superintendent, Arnold Engineering Foundry, Marengo, Ill.

PROVEN MULLERS ON THE "COLD PROCESS"	SIMPSON "Mix-Muller" BEARDSLEY & PIPER "Speed-Muller" and "Mulbarow" BAKER-PERKINS "Unidor" CLEARFIELD "Muller"
PROVEN MULLER ON THE "HOT PROCESS"	BEARDSLEY & PIPER "Shell-Sand Speed-Muller"

PLASTISAND Process utilizes a revolutionary new method for coating sand with liquid-resin for foundry shell molding.

This new development by Acme Resin Corporation in the field of shell molding has several positive advantages that overcome the primary deterrents to the use of the more widespread "C" or shell molding process.

Foundries using the PLASTISAND Process report PROVED SAVINGS, PROVED SAFETY and PROVED SUPERIORITY of molds with as little as one-half the resin content formerly necessary with dry resin.

With the PLASTISAND Process, a shorter dwell is possible and a faster cure is assured, from a shorter time on the pattern and a faster baking cycle.

Acme's new PLASTISAND Process is adaptable to dump-box, roll-over and blowing of either shells or cores. It uses either hot or cold mulling—in both, Acme liquid resin is used.

An informative folder has been prepared to better acquaint the foundry industry with the new PLASTISAND Process. It may be obtained by writing to the ACME RESIN Corporation at the address listed here.

ACME RESIN CORPORATION

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TRADE . . Publications

For More Details Use Reply Card—Page 245

PYROMETERS: General Electric Co., Schenectady 5, N. Y.—Applications, operating and maintenance features and functional principles of indicating and controlling pyrometers and resistance thermometers for the indication and control of temperature in industrial processes are contained in bulletin GEC-713C.
For More Details Circle No. 121—Page 245

HOSE AND FITTINGS: Aeroquip Corp., Jackson, Mich.—Socketless hose and fittings for replacement in all low and medium pressure applications are described in bulletin 134.
For More Details Circle No. 122—Page 245

SAFETY SYSTEM: Mine Safety Appliances Co., 201 North Braddock Ave., Pittsburgh 8, Pa.—Interplant communications system and its parts are pictured and described in bulletin 1601-8. System can be used to transmit repeated safety reports, instructions, announcements or other information.
For More Details Circle No. 123—Page 245

INDUSTRIAL FANS: American Blower Corp., Detroit 32, Mich.—Two models of fans for industrial and commercial ventilation are described in bulletin 7214. Tables of performance, power requirements, delivery ratings at different static pressures, fan speed, motor horsepower, nominal rotor diameter, net weight and installation drawings are included.
For More Details Circle No. 124—Page 245

AIR MOTOR: Bellows Co., 222 West Market St., Akron, O.—Bulletin ML-3 illustrates and describes controlled air power units and interchangeable valves that can be incorporated into machine tools and existing production machines to convert them to automatic or semiautomatic operation.
For More Details Circle No. 125—Page 245

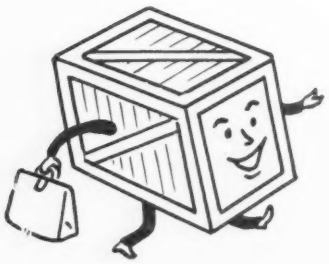
OVERHEAD HANDLING: American MonoRail Co., 13104 Athens Ave., Cleveland 7—Bulletin C-1 illustrates hundreds of applications for overhead materials handling equipment. Schematic drawings pointing up advantages of conveyor components are included.
For More Details Circle No. 126—Page 245

SALT BATH FURNACES: Hevi Duty Electric Co., Milwaukee 1, Wis.—Advantages, construction features, engineering data and specifications for salt bath furnaces of the immersed electrode type with temperatures ranging from 300 to 2400° F are offered in bulletin 655.
For More Details Circle No. 127—Page 245

PORTABLE AIR HEATER: Herman Nelson Portable Products, American Air Filter Co., Moline, Ill.—Folder provides data on three portable air heaters with capacities from 75,000 to 450,000 Btu per hr. All are oil fired, gas or electric powered.
For More Details Circle No. 128—Page 245

ROD STRAIGHTENER: Hydro-Blast Corp., 2550 North Western Ave., Chicago 47, Ill.—Folder relates how core rod straightener reduced rod material costs and rod straightening time so the machine paid for itself in less than six months.
For More Details Circle No. 129—Page 245

MOLDING SANDS: New Jersey Silica Sand Co., Millville, N. J.—Brochure contains colored photographs of company sand deposits, office and maintenance facilities, moisture con-



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Yes sir, that FIRST Standard 35C Infinitely Variable Speed Grinder we shipped to Marion Malleable in Marion, Indiana SOLD 4 MORE IN LESS THAN A YEAR! When we asked grinding room Super Harold Williams about it, his answer was short — and mighty sweet: "WITH YOUR GRINDERS, WHEEL COST IS DOWN AND PRODUCTION'S UP!"

Here's the way it looks all dolled up in chart form:

Make of Grinder	Wheel Cost Per Ton	Avg. Hourly Production-Tons
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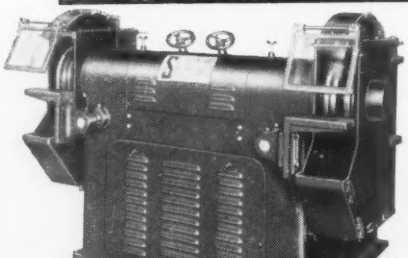
IT'S THE STANDARD STORY WHEREVER YOU GO. like we said "mighty sweet" ...FOR RAISING YOUR PROFIT CURVE.

SUPER SALESMAN!
The Standard No. 35C Infinitely Variable Speed SNAGGING GRINDER



Batteries of Standard Grinders, Marion Malleable

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for accurate measurement of heat of MOLTEN METALS

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Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

trol plant and laboratory. Included are analyses of moisture controlled naturally bonded sands sold by the company.
For More Details Circle No. 130—Page 245

OIL-HYDRAULIC PUMPS: Vickers Inc., 1400 Oakman Blvd., Detroit 32, Mich.—Catalog 5001A contains engineering, design and application information relating to pumps, pressure controls, volume controls, directional controls, control assemblies, hydraulic motors, transmissions, cylinders and hydraulic accessories.
For More Details Circle No. 131—Page 245

CORROSION CONTROL: American Zinc Institute, 60 East 42nd St., New York 17, N. Y.—Illustrated booklet, "How Zinc Controls Corrosion," presents drawings, charts, photographs and descriptions of ways zinc lengthens the life of steel products and reduces maintenance costs.
For More Details Circle No. 132—Page 245

CONVEYING SYSTEM: Crane Co., 836 South Michigan Ave., Chicago 5, Ill.—Bulletin AD-2030 presents in-use application photographs, sketch of a typical installation in an iron foundry, cut-away operational sketch, dimensional data and general information on a pneumatic conveying system for flowable materials.
For More Details Circle No. 133—Page 245

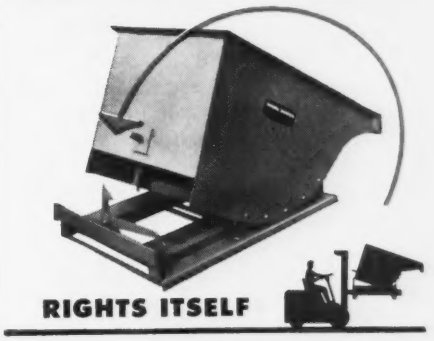
MAGNETS: Ohio Electric Mfg. Co., 5400 Dunham Rd., Maple Heights, Cleveland, O.—Photographs, drawings, schematic and dimensional diagrams, performance data and general information on lifting and separation magnets and magnet control equipment are found in catalog 114.
For More Details Circle No. 134—Page 245

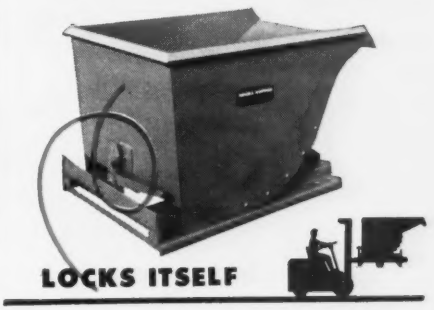
STEEL SHELVING: Borroughs Mfg. Co., 3002 North Burdick, Kalamazoo, Mich.—Catalog describes construction and installation features of steel shelving. Twenty-four different units are illustrated. Detailed information on how to plan a steel shelving layout is included.
For More Details Circle No. 135—Page 245

TEMPERATURE INSTRUMENTS: Fischer & Porter Co., Hatboro 35, Pa.—Line of filled thermal systems for indicating, recording, controlling, transmitting, compensating and programming temperatures from −400 to +1000°F are illustrated and described in catalog 12-A-10.
For More Details Circle No. 136—Page 245

DISC GRINDING WHEELS: Bay State Abrasive Products Co., Westboro, Mass.—Vol. 1, No. 1, "Grinding Wheel Reporter," offers an illustrated case history of a metal fabricator whose grinding wheel production was tripled by use of reinforced resinoid, raised hub disc wheels.
For More Details Circle No. 137—Page 245

LIFT TRUCK GUIDE: Hyster Co., 2902 North East Clackamas, Portland 8, Oreg.—Analysis guide and rating table, "How to Select a Lift Truck,"





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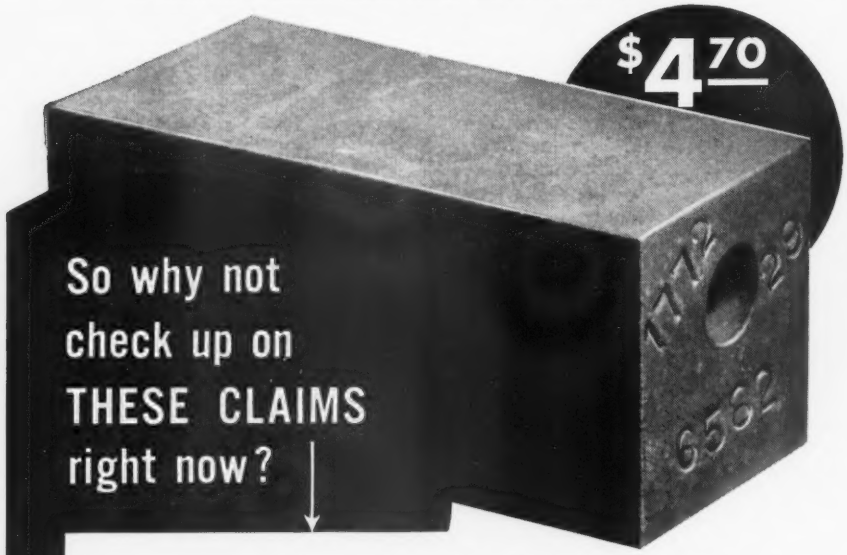

CARBOFRAX® silicon carbide slag hole blocks last *twenty or more hours* in continuous pour cupolas . . . a full day's run and then some! And they provide this kind of service with *little or no change in hole size.* . . . Can you say the same of your present slag hole blocks? If not, better order a CARBOFRAX block from us right now and see for yourself how much better it is. Single standard size block costs $4.70. Other sizes available from stock molds. Address Dept. AA115, Refractories Division, The Carborundum Company, Perth Amboy, N. J.

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is based on user evaluation of job requirements and truck features by points with a chart and guide. Several trucks can be compared and total points achieved by each are divided by the selling price to determine a price-per-point.

For More Details Circle No. 138—Page 245

NEOPRENE DRIVE BELT: Elastomers Division, E. I. duPont de Nemours & Co., Wilmington 98, Del. — "Neoprene Notebook No. 65," twelfth in company's "Language of Rubber" series, describes the effects of sun, atmosphere and climate on rubber. A neoprene drive belt design with V-shaped grooves in belt and pulley that reduces sheave width, prevents run-offs and eliminates matching problems is featured in the publication.

For More Details Circle No. 139—Page 245

SCALE MODELS: Knight Models Inc., 549 West Randolph St., Chicago 6, Ill.—Illustrated folder points out advantages and applications of 3-dimensional models in plant design, layout and production, employee training, architecture and construction, planning and site development.

For More Details Circle No. 140—Page 245

INSTALLATION ANALYSIS: Claude B. Schneible Co., P. O. Box 81, North End Station, Detroit 2, Mich.—Installation of a dust collection system in a large, nationally known company was tested by engineering firm. Details of test in original form are offered.

For More Details Circle No. 141—Page 245

MATERIAL HANDLING: Conco Engineering Works, Mendota, Ill.—Bulletin 3000-A presents general information on hand geared traveling cranes, I-beam electric crane bridges, overhead traveling cranes, trolley hoists, jib cranes and chain hoists and trolleys.

For More Details Circle No. 142—Page 245

INDUSTRIAL PRODUCTS: Jeffrey Mfg. Co., Columbus 16, O.—Manufacturing facilities and products of the company are illustrated in booklet. Company produces min-

"No, No, Muldoon—just the sand on top!"

No Matter What Your SAND Requirements...

Look to WEDRON

- **Rounded Grain Sand**
- **Uniform Screen Sizes**
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- **Special Grades For Every Purpose**

THERE'S no guesswork with WEDRON sands for foundry use. You can order what you require and be sure that you're getting *exactly* the grade you specify. Each and every shipment is uniformly graded to exacting standards at the WEDRON plants.

Whether you do shell-mold casting, lost wax casting, or any other special type of foundry work, you can get the sand you need from WEDRON. The finest silica sands in America are mined in the Ottawa-Wedron region of Illinois where all of WEDRON'S sands are produced.

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WEDRON SILICA COMPANY

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ing, processing and conveying equipment, chains, power transmission machinery and other related equipment.
For More Details Circle No. 143—Page 245

FLEXIBLE HOSE: Universal Metal Hose Co., 2133 South Kedzie Ave., Chicago 23, Ill.—Use and application data on flexible hose products designed to compensate for conditions of varied pressure, elevated temperature, motion and vibration for a wide range of conveyance problems are found in catalog U-333.
For More Details Circle No. 144—Page 245

PYROMETER TIPS: Barber-Colman Co., Wheelco Instruments Division, Rockford, Ill.—Bulletin F7259 gives service tips for pyrometer users. Information is designed to serve as reference material and was accumulated from company's service organization.
For More Details Circle No. 145—Page 245

FOUNDRY PRACTICE: Foundry Services Inc., 2000 Bruck St., Columbus 7, O.—Service bulletin 3 provides general information on shrinkage porosity in small bronze castings, how design affects practice, aluminum sand casting defects and cause and cure of casting defects.
For More Details Circle No. 146—Page 245

PLUNGER PUMPS: Worthington Corp., Harrison, N. J.—Outline drawings, specifications, major features, dimensions and general information on single acting plunger pumps with 2, 4, 5 and 6-in. strokes with capacities up to 225 gpm are found in bulletin W-414-B45A.
For More Details Circle No. 147—Page 245

DIE CASTING FINISHES: Frederic B. Stevens Inc., 1800 18th St., Detroit 16, Mich.—Bulletin PP-125 describes finishing recommendations for many die cast items ranging from automotive door handles to camera range finders.
For More Details Circle No. 148—Page 245

TAKEUPS: Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.—Complete information, including dimension charts, on conveyor takeups available with babbitted, ball or roller bearings is found in folder 2539.
For More Details Circle No. 149—Page 245

PROTECTING TUBES: Claud S. Gordon Co., 3000 South Wallace St., Chicago 16, Ill.—Details, application data and ordering information on thermocouple protecting tubes and protecting wells are in bulletin 11-13.
For More Details Circle No. 150—Page 245

CONVEYOR BELTING: Hewitt-Robins Inc., Stamford, Conn.—Wall chart on proper selection and maintenance of conveyor belting contains 12 practical maintenance tips for getting longer life out of belts.
For More Details Circle No. 151—Page 245

APPARATUS CATALOG: Laboratory Equipment Corp., St. Joseph, Mich.—Catalog contains illustrations,

Use REMA to add years of life to your Belts

REMA is the New and Amazing Self-Vulcanizing Rubber Repair Material

REMA
REQUIRES
- NO HEAT
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- NO CURING TIME DELAY

• REMA is not just another cold patch. REMA is vulcanization by chemical process. The repaired area is sealed with an abrasive resistant cover stock patch. No heat or heavy vulcanizing equipment required. Here's the astonishing advantage—*when repair work is completed belts may be returned to service immediately.*

• REMA seals out moisture, reduces mildew, rot and deterioration — the great enemies of conveyor belts. Your own maintenance man can quickly repair your belt — it doesn't take a skilled belt mechanic to use REMA.

• Used for repair of all types of damaged spots, edge wear and for covering metallic joints. Available in introductory kits or parts separately.

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REMA SELF-VULCANIZING
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NEW...

- New low prices
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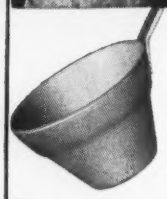

Available with or without handles — in stainless steel and mild steel.

If you pour non-ferrous alloys — now, more than ever, Spincraft ladles belong in your plant. You can select from 23 practical sizes (from ¼ lb. to 30 lb. capacity in molten aluminum) — in top quality stainless steel — for *less* than you've ever paid before.

And . . . experience shows new Spincraft ladles actually cost less to use. Here's why —

Reinforced cup bottom and pouring edge have been spun to a heavier gauge than the weight-saving side walls. This means you get easier handling, better heat transfer, and reduced "burnouts" for longer ladle life. Handles are "whack-proof". Cup surfaces are specially finished to hold any type of ladle coating longer.

Hand any operator a new Spincraft ladle — and the next day try to take it away from him! You'll see how the practical conical shape, the built-in overall balance, minimizes spillage as he "swings" from crucible to machine or mold. Notice how every motion takes less effort. And there's a reason: — for example — a Spincraft stainless steel ladle in the 65 cu. in. size weighs from 2 to 11 pounds *less* than conventional cast or malleable iron, forged or pressed steel ladles.

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Write today for new low prices. Special sizes, gauges, handles and materials will be quoted on request.

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information and prices on laboratory equipment for combusting samples of iron, steel, ore, ferroalloys and other materials for the analysis of carbon.
For More Details Circle No. 152—Page 245

BEARINGS AND ROD ENDS: Kahr Bearing Division, Aetna Steel Products Corp., 812 South Flower St., Burbank, Calif.—General catalog lists and illustrates line of self aligning spherical bearings and rod ends, including complete engineering data and specifications.
For More Details Circle No. 153—Page 245

LEASING PLAN: Orton Crane & Shovel Co., 608 South Dearborn St., Chicago 5, Ill.—Brochure describes advantages of leasing cranes without capital investment and compares a leasing plan with a time purchase plan. Examples of payment charts as well as re-leasing payments are included.
For More Details Circle No. 154—Page 245

BATTERY MAINTENANCE: Exide Industrial Division, Electric Storage Battery Co., 42 South 15th St., Philadelphia 2, Pa.—Illustrated chart suitable for wall mounting points out seven basic rules to obtaining good service and long life from industrial batteries.
For More Details Circle No. 155—Page 245

RUST PENETRATION: Rust-Oleum Corp., 2799 Oakton St., Evanston, Ill.—Thirty-page report reveals results and methods of three years of research by radioactive tracer technique in tracing the penetration of a fish - oil - base protective coating through rust to bare metal.
For More Details Circle No. 156—Page 245

REFRACTORIES: Johns-Mansville, 22 East 40th St., New York 16, N. Y. —Illustrated booklet, "Firecrete and Blazecrete," describes manufacturing methods used to produce hydraulic setting refractories for services through 3000° F.
For More Details Circle No. 157—Page 245

L-P LIFT TRUCKS: Towmotor Corp., 1226 East 152nd St., Cleveland 10, O.—Brochure SP-21 reports operational and maintenance savings to be realized with use of liquefied-petroleum-gas-fueled fork lift trucks.
For More Details Circle No. 158—Page 245

AIR FILTERS: Master Pneumatic Inc., 20432 Sherwood, Detroit 34, Mich.—Unusual features, listings of sizes and types, dimension sheets and installation and maintenance data for air filters and lubricators are contained in catalog.
For More Details Circle No. 159—Page 245

METAL TREATING UNIT: Ipsen Industries Inc., Rockford, Ill.—Pertinent specifications and features of controlled atmosphere laboratory metal treating unit of 25 lb per hr capacity are found in bulletin RT-10.
For More Details Circle No. 160—Page 245

ANCHORS AND HANGERS: North American Refractories Co., National City-East 6th Bldg., Cleve-

PYRO

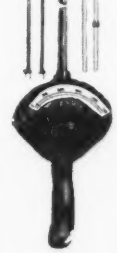
Instruments for precision temperature measurement

The Simplified PYRO Optical Pyrometer

The only completely self-contained and direct reading Optical Pyrometer for quick and accurate temperature measurements of molten iron, steel, monel, etc. No calibration charts or accessories required. Weighs only 3 lbs. PYRO will pay for itself many times over by helping prevent spoilage. Write for Catalog #85.

The Improved PYRO Surface Pyrometer

The ideal instrument for quick and accurate surface temperature measurements —particularly for shell molding, core oven, mold and die temperatures. Designed for ruggedness and accuracy it features automatic cold end compensator, large 4¾" direct reading dial and shock, moisture and dust-proofed shielded steel housing. Ask for Catalog #168.



The New PYRO Immersion Pyrometer

Helps insure low-cost production of SOUND and UNIFORM non-ferrous castings. Withstands roughest handling. "Protected Type" and "Bare Metal" thermocouples instantly interchangeable. Equipped with exclusive LOCK SWIVEL. Stock ranges from 1000°F to 2500°F. Ask for Catalog #155.

THE PYROMETER INSTRUMENT COMPANY Inc.
Bergenfield 6, New Jersey, U. S. A.

land 14, O.—Bulletin 109 describes practical methods for anchoring and suspending plastic and castable refractories in furnaces to secure maximum service life.
For More Details Circle No. 161—Page 245

INSTRUMENTATION: Hays Corp., Michigan City, Ind.—Catalog 55-605-83 provides data on line of power plant instruments and control systems. Combustion guides, draft gages, flow, level temperature and pressure instruments, combustion control systems and panels are illustrated by photos and schematic drawings.
For More Details Circle No. 162—Page 245

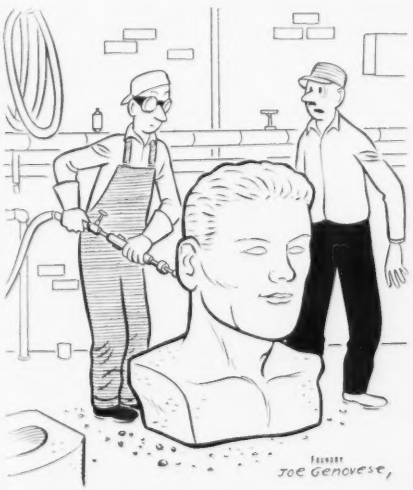
ABRASIVE BELT UNIT: Grinding & Polishing Machinery Corp., 2530 Winthrop Ave., Indianapolis 5, Ind.—Adaptability of abrasive belt unit and accessories is shown in bulletin 104. Unit is for almost every type of belt grinding and polishing within the capacity of its 2½-in. belt and 2-hp motor.
For More Details Circle No. 163—Page 245

GRINDING WHEELS: Sterling Grinding Wheel Co., P. O. Box 801, Tiffin, O.—General catalog 1-55 provides engineering data on standard stock abrasive grinding wheels, mounted shapes and points, bricks, sticks and dresser wheels. List and net price schedules also are included.
For More Details Circle No. 164—Page 245

MASONRY BLADES: Carborundum Co., Niagara Falls, N. Y.—Bulletin A-1308 covers blade types and sizes, applications, comparative grade chart, blade identification system and ordering information for line of masonry blades.
For More Details Circle No. 165—Page 245

SOLENOID VALVE: Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.—Bulletin V5003 details a four-way dual and single solenoid valve for control of double-acting hydraulic or pneumatic cylinders.
For More Details Circle No. 166—Page 245

REPRODUCTION MATERIALS: Graphic Reproduction Division, Eastman Kodak Co., Rochester 4, N. Y.—



". . . and don't forget to clean behind the ears . . ."

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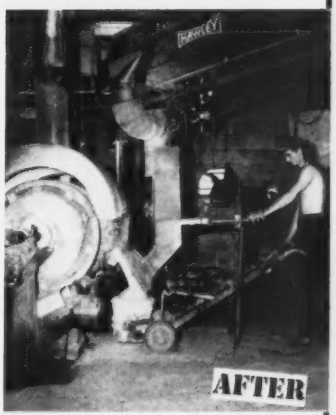

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Materials available for the preparation and reproduction of drawings and documents are described in detail in booklet, "Kodagraph Reproduction Materials."

For More Details Circle No. 167—Page 245

CONCRETE FLOORS: National Sanitary Supply Association Inc., Suite 105, 139 North Clark St., Chicago 2, Ill.—"The Care and Maintenance of Concrete Floors" presents cleaning, finishing and daily maintenance tips for concrete floors. The basic concrete floor is described and some common faults are illustrated.

For More Details Circle No. 168—Page 245

CHAIN BLOCKS: Manning Maxwell & Moore Inc., Shaw-Box Crane & Hoist Division, Muskegon, Mich.—Sizes, catalog numbers, prices, operating data, outline dimensions and general information on chain blocks and trolleys with capacities up to 4000 lb are found in bulletin 412.

For More Details Circle No. 169—Page 245

FORK TRUCKS: Lamson-Mobilift Corp., 835 South East Main St., Portland 14, Oreg. — Photographs, color sketches, tables of specifications and general information on stand-up and sit-down fork lift trucks are offered in bulletin. Sketches of 12 matched attachments also are offered.

For More Details Circle No. 170—Page 245

AIR FILTERS: Hankison Corp., 540 Biltmore Bldg., 951 Banksville Rd., Pittsburgh 16, Pa. — Bulletin M-7155 presents information on two units to clean and dry compressed air by use of an internal condenser in combination with a disposable filter cartridge in a heavy gage steel casing.

For More Details Circle No. 171—Page 245

RUBBER PRODUCTS: Thermoid Co., Trenton, N. J.—Specifications and descriptions of rubber hose, conveyor belts, flat power transmission belting, multiple and fractional hp v-belts, chute lining, rubber sheet packing and industrial friction materials are contained in form 3765-R.

For More Details Circle No. 172—Page 245

CHISEL SHANK: Delaware Tool Steel Corp., Wilmington 99, Del.—Folder introduces a pneumatic chisel shank that features a large cross section and lacks sharp corners to increase strength and efficiency as the full power of the hammer is delivered to the cutting edge of the tool.

For More Details Circle No. 173—Page 245

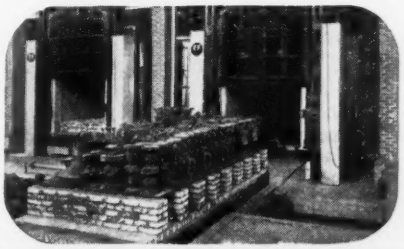
INSPECTION INSTRUMENTS: Eder Instruments Co., 2293 North Clybourn Ave., Chicago 14, Ill.—Flexible and rigid inspection instruments that permit inspection of pockets, corners, joints or moving parts not visible or accessible to the human eye are illustrated in folder.

For More Details Circle No. 174—Page 245

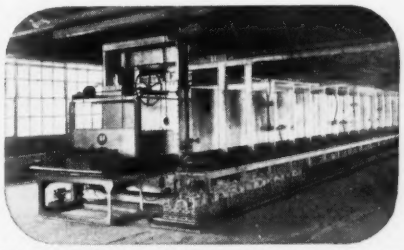
FORK TRUCKS: Baker-Raulang Co., Cleveland 2, O.—Tables of dimensions, capacities, weights, speeds, and details of design and

EF FURNACES

for EVERY Foundry Heat Treating Requirement



EF DOUBLE CHAMBER CAR TYPE FURNACE for annealing castings, equipped with three furnace cars and one transfer car incorporating car puller. Built by The Electric Furnace Co., Salem, Ohio.



EF ELECTRICALLY HEATED CONTINUOUS ROLLER HEARTH FURNACE for the scale-free annealing of various iron alloy castings in special atmosphere. Built by The Electric Furnace Co., Salem, Ohio.

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construction of electric fork trucks with capacities of 1500, 2000 and 2500 lb are offered in bulletin 1327D.
For More Details Circle No. 175—Page 245

CRUCIBLE CARE: Crucible Manufacturers' Association, 27 William St., New York 5, N. Y.—No. 4 in series of leaflets emphasizes that proper fitting, well-designed hardware for handling crucibles will prolong crucible life and promote safe foundry operations.
For More Details Circle No. 176—Page 245

INDUSTRIAL TRUCKS: Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, O.—Broadside contains 24 cost-cutting ideas with industrial trucks of standard and special design. Fork trucks, low and high lift platform trucks and cranes are pictured and described.
For More Details Circle No. 177—Page 245

THERMOCOUPLE CONNECTORS: Minneapolis-Honeywell Regulator Co., Wayne and Windrim Aves., Philadelphia 44, Pa.—Specification sheet 56 describes Army-Navy thermocouple connectors that provide a detachable connection for one or more thermocouple circuits.
For More Details Circle No. 178—Page 245

SPECTROPHOTOMETRY: Beckman Division, Beckman Instruments Inc., Fullerton, Calif.—Application data sheets DU-36-M and DU-39-M are reports of how two metal producers have solved metal analysis problems by use of spectrophotometry.
For More Details Circle No. 179—Page 245

HYDRAULIC VISE: Columbian Vise & Mfg. Co., 9021 Bessemer, Cleveland 4, O.—Illustrated bulletin lists specifications of hydraulic vise controlled by foot pedals, leaving operator's hands free for positioning and handling.
For More Details Circle No. 180—Page 245

PNEUMATICS: Ross Operating Valve Co., 120 East Golden Gate Ave., Detroit 3, Mich.—Vol. 1, No. 1 of bimonthly journal *Ross enginAIR* features application stories with engineering drawings discussing the fundamentals of pneumatics.
For More Details Circle No. 181—Page 245

AIR METERS: New Jersey Meter Co., Plainfield, N. J.—Bulletin A-8 covers two pulsation compensated air meters to control air flow of any operation or process at a rate that gives effective production and high air economy.
For More Details Circle No. 182—Page 245

COMPRESSORS: Worthington Corp., Harrison, N. J.—Advantages on installation, operation and maintenance costs with information and illustrations of feather valve compressors from 75 to 350 hp is subject of bulletin L-676-B1A.
For More Details Circle No. 183—Page 245

PROPORTIONAL CONTROLLERS: Foxboro Co., Foxboro, Mass.—Bulletin 4-11 describes electric proportional controllers for control of dew point,

Here, sir, is the story of Haylco Automatic Sand Control (The
HARTLEY HYGRO-GUIDE, HARTLEY TIME GUIDE, BOND GUIDE . . . . and SAND LEVEL CONTROL)

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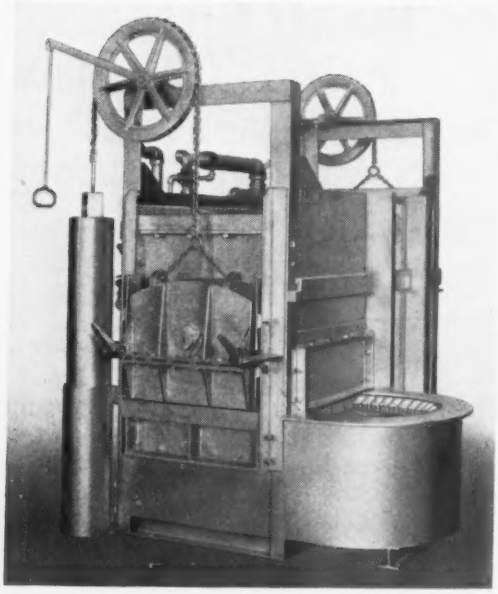

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For More Details Circle No. 184—Page 245

STEEL SHELVING: Remington Rand Division, Sperry Rand Corp., 315 Fourth Ave., New York 10, N. Y. — Descriptions, specifications and photographs of representative steel shelving installations covering wide variety of applications are included in catalog FF188.
For More Details Circle No. 185—Page 245

SCOOPS: Lewis-Shepard Products Inc., Dept. R-17, Watertown, Mass. —Circular describes and illustrates hydraulic and mechanical scoops for bulk handling that are designed to add to the versatility and efficiency of many fork truck operations.
For More Details Circle No. 186—Page 245

HYDRAULIC TRANSMISSION: Gerotor May Corp., Box 86, Baltimore 3, Md.—Technical data, performance chart, dimensions, drawings and applications for a variable speed hydraulic transmission are offered in catalog T-100.
For More Details Circle No. 187—Page 245

FUEL OIL TREATMENT: Dacar Chemical Products Co., McCartney at Wabash St., Pittsburgh 20, Pa.—Bulletin describes some of the properties and benefits to be derived from the chemical treating of various grades of fuel oil.
For More Details Circle No. 188—Page 245

VACUUM PUMPS: Kinney Mfg. Division, New York Air Brake Co., 3640 Washington St., Boston 30, Mass.—Catalog 425 covers line of high vacuum pumps and features a section containing formulas and data of value to vacuum engineers.
For More Details Circle No. 189—Page 245

VISES: Wilton Tool Mfg. Co., 941 Wrightwood Ave., Chicago 14, Ill.—Illustrated catalog 110-B covers engineering data and specifications for line of vises, work positioners, C-clamps and replacement parts.
For More Details Circle No. 190—Page 245

REFRACTORIES: Mullite Refractories Co., Shelton, Conn.—Catalog 102 contains illustrations of typical installations as well as performance data, specifications and properties of six types of refractories.
For More Details Circle No. 191—Page 245

STRIP - CHART RECORDERS: Bristol Co., Waterbury 20, Conn.—Bulletin describes line of 6-in. strip-chart recorders for pressure, liquid level, temperature, flow and mechanical motion applications.
For More Details Circle No. 192—Page 245

STORAGE BINS: Kalamazoo Tank and Silo Co., Kalamazoo, Mich.—Bulletin 1153-B shows design, construction, installation and engineering details of glazed tile storage bins.
For More Details Circle No. 193—Page 245

DUST FILTER: Day Co., 810 Third Ave., N.E., Minneapolis 13, Minn.—Features, schematic operating dia-

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by Pat Dwyer, formerly, Engineering Editor FOUNDRY magazine

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grams, performance curves, comparison charts and engineering data on reverse jet dust filter are contained in bulletin 559.
For More Details Circle No. 194—Page 245

DRAWER TYPE OVENS: Porbeck Mfg. Co., 2600 North 9th St., St. Louis 6, Mo.—Bulletin describes a double drawer loading core oven designed for continuous operation. A variety of drawer sizes is available. Fuel can be oil, gas or electricity.
For More Details Circle No. 195—Page 245

HEAT TREATING: American Gas Furnace Co., 444 Lafayette St., Elizabeth, N. J.—Catalog 850.10 provides details of automatic, continuous heat treating installations with production capacities from 100 to 800 lb per hour.
For More Details Circle No. 196—Page 245

AIR CYLINDERS: Modernair Corp., 400 Preda St., San Leandro, Calif. — Photographs, prices, basic dimensions and features of universal mount, clamp type air cylinders are found in pocket-size folder.
For More Details Circle No. 197—Page 245

DRY FLUID DRIVE: Dodge Mfg. Corp., Mishawaka, Ind. — Selection charts, dimensional drawings, prices and recommended V-belt drives for dry fluid drives and couplings are found in bulletin A-640.
For More Details Circle No. 198—Page 245

JAR MACHINES: Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa. —Jarring machines—plain or shockless—in capacities ranging upward from 300 lb are illustrated and described in bulletin 513.
For More Details Circle No. 199—Page 245

FOUNDRY reprints

Better Castings With Less Metal by A. J. Stone, H. B. Kinnear and A. R. Fraser reveals that new rapidly igniting exothermic compounds have been used on open risers of castings and on the hot tops of ingots to eliminate excessive piping and shrink cavities caused by premature freezing of the metal.
For a Free Copy Circle No. 200—Page 245

Production and Quality Raised by Automated Sand System by I. H. Richardson describes an automated sand formulation, processing, handling and distributing system installed at General Electric Co., Everett, Mass. System has boosted GE's production per man on sand preparation by 800 per cent.
For a Free Copy Circle No. 201—Page 245

Dual Purpose Plastic Core Driers by Don W. Schmanski presents general specifications and uses for a high-impact, heat-resistant, thermosetting molding compound suitable for all core driers. Driers can be used in high-frequency dielectric ovens and in hot air type ovens.
For a Free Copy Circle No. 202—Page 245

For longer abrasive life you want . . .

TRU-STEEL lasts longer than ordinary steel shot. It *should* last longer because it's not only heat-treated, but drawn to exacting tolerances. Tru-Steel saves on machine parts, too, because it will not break down into fines that cause wear . . . *controlled chemistry, plus painstaking control checks give Tru-Steel the right hardness for fast, thorough cleaning.*

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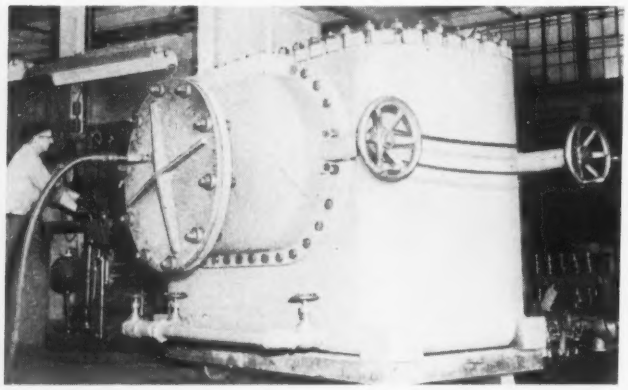
Subsidiary of Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

The Shakeout

Giant Pipe-Line Strainer Weighs 4½ Tons

TYPICAL of the giant strainers required today because of American industry's expanding use of water, this 24-in. duplex-type strainer is receiving a hydrostatic test before shipment from J. A. Zurn Mfg. Co., Erie, Pa. It is 6 ft. high, weighs 4½ tons and will be installed in a



spray cooling unit at the Brookfield, Ill., plant of Reynolds Aluminum Co.

High gallonages of water are required for process work in the plant, and for economy, water is constantly recirculated, with cooling and straining phases. Two disk-type valves on the sides of the semisteel housing divert flow from one side to the other so that the strainer can be cleaned without an interruption of plant operations. Zurn makes pipe-line strainers for pipes ranging in size from ⅜ to 36 in.

For More Details Circle No. 207—Page 245

Cast Piston Rings Get Fast Cleaning

PRODUCTION of cast piston rings at Muskegon Piston Ring Co., Sparta, Mich., averages 200,000 per 8-hr shift, ranging in diameter from ½ in. to 3 ft. During their clean-

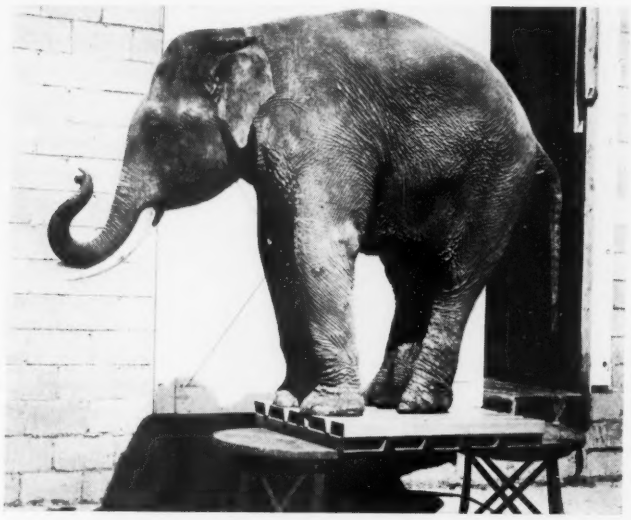
ing, close control of blasting time must be maintained because the rings are only 5/64-in. thick. Overblasting would cause warping and too smooth a finish, yet perfect cleaning is essential to quality. The company does the job with four airless blast barrels made by Pangborn Corp., Hagerstown, Md.

Each barrel is equipped with a timer that automatically shuts it off at the end of the five-to-six-minute cleaning cycle. Two 12-ft barrels clean the rings after sprues and risers have been cut off. The latter are cleaned in two or three minutes in two 18-ft barrels, before remelting.

For More Details Circle No. 208—Page 245

Corrugated Steel Pallet Holds 2 Tons

MORE THAN two tons of Indian elephant demonstrate the strength of this new reversible pallet, produced by Union Metal Mfg. Co., Canton, O. It's constructed of two corrugated steel decks, with corrugations on one

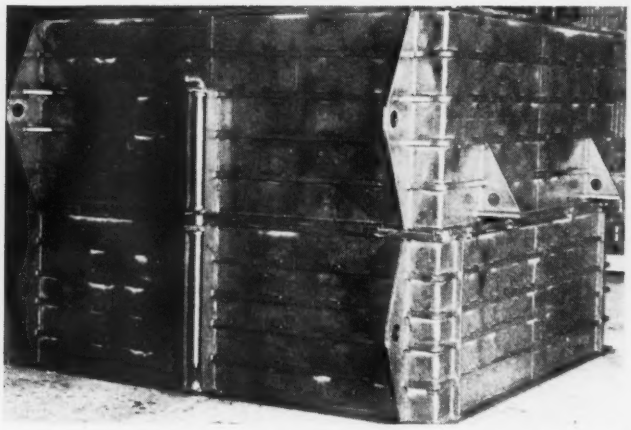


deck running at right angles to those on the other. The open-end, crisscross corrugations, 2½ in. deep on 9-in. centers, permit four-way fork entry by lift trucks.

For More Details Circle No. 209—Page 245

Company Makes Huge Metal Flask

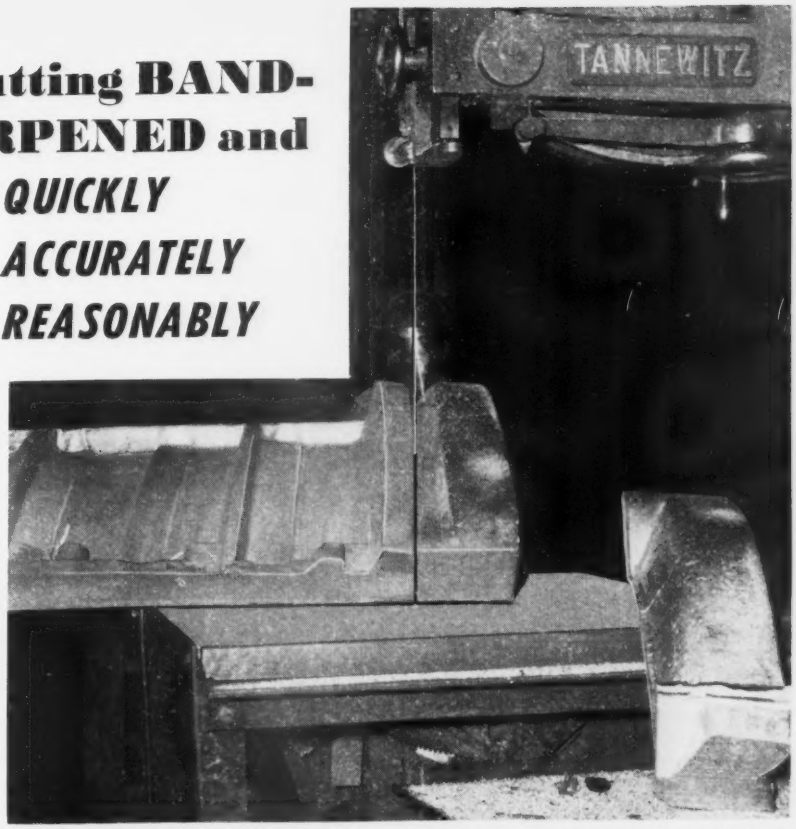
THE FLASK shown in the accompanying illustration is said to be one of the largest metal flasks ever fabricated. It measures 90 x 103 in., with walls ⅜ in. thick. Cope half is 42 in. deep while the drag half is 36 in. deep.



Bearings are 1 x 2½ in. The unit was manufactured by Black, Sivalls & Bryson Inc., Kansas City, Mo., manufacturer of molding flasks.

For More Details Circle No. 210—Page 245

Nonferrous metal-cutting BAND-SAW BLADES SHARPENED and REPAIRED . . . . . *QUICKLY ACCURATELY REASONABLY*



The Lennox blade you see here in a Tannewitz machine is one of our responsibilities. We keep it sharpened and repaired for the Harsch Bronze and Aluminum Foundry, Cleveland, where it gets plenty of hard service. Photo shows it sawing a large riser from a heavy aluminum casting. Jobs like these are rough on bandsaw blades—and that's why our services are so helpful. We keep these blades sharp; we adjust the teeth, check the pitch, and keep life in blades that otherwise are headed for the scrap pile. If you use metalcutting bandsaws, we can save you money by taking care of your blades. Just ask us; we'll show you. Write today:

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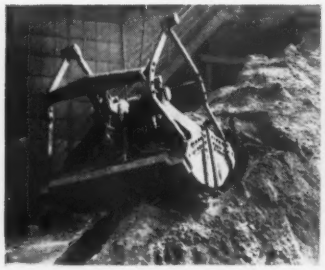
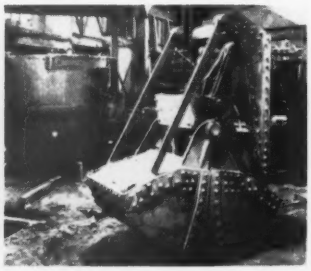
Blaw-Knox "Shark Tooth" Single-Line Hook-On Buckets are the double-barrelled punch you need to cut the cost of rehandling coke, coal, sand and small limestone, *because they are dual-purpose buckets.* With liner plates attached, you can handle fine granular materials with minimum leakage. Without the liner plates, the "shark teeth" assure minimum degradation of coke.

BLAW-KNOX SINGLE-LINE HOOK-ON TYPE BUCKETS SOLVE AVERAGE OR UNUSUAL HEADROOM CONDITIONS



For extremely limited headroom, this ¾-yd. bucket requires only 6'7" operating headroom. Blaw-Knox Buckets designed for low headroom conditions are also available in larger sizes.



For average headroom, there's a size and type of Blaw-Knox Foundry Bucket to meet a wide range of conditions. Write for Bulletin 2232 for details.

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Pittsburgh 38, Pa.
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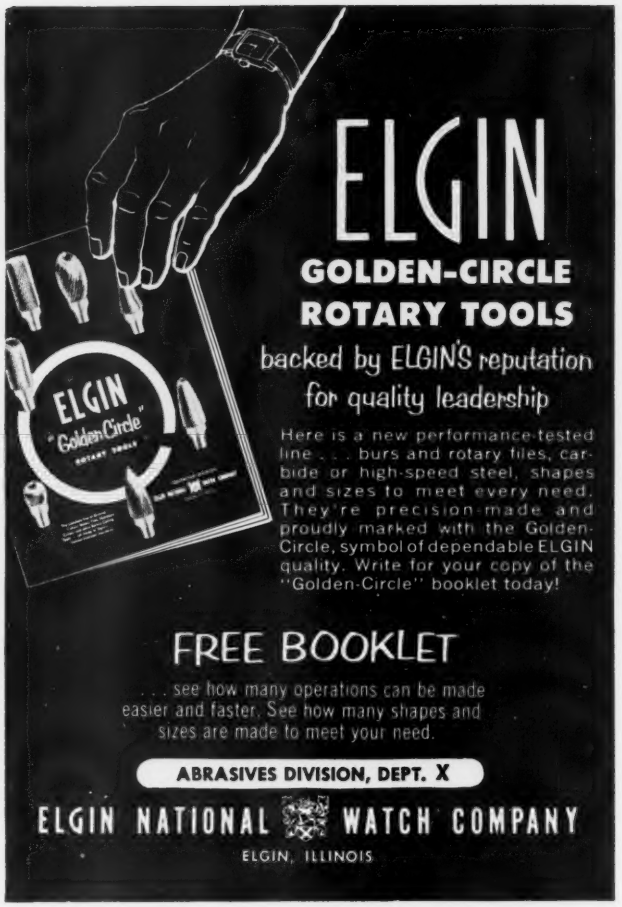

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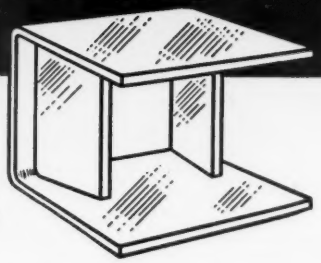

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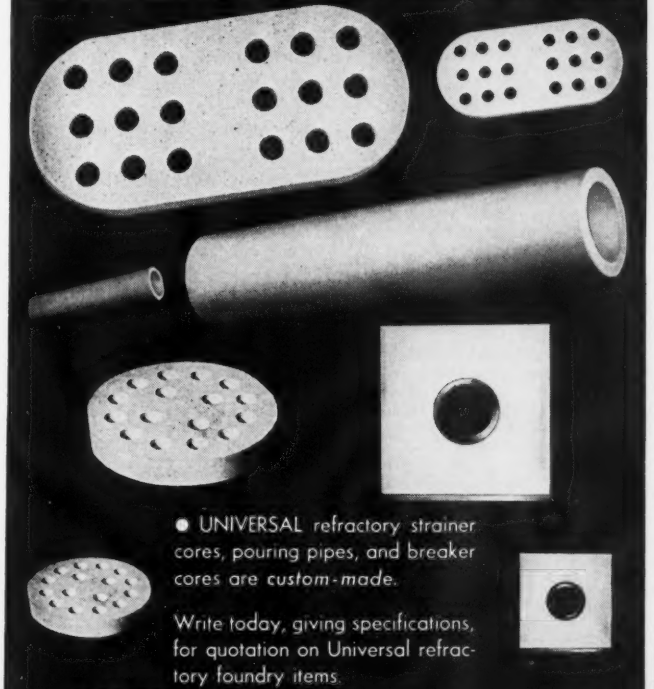

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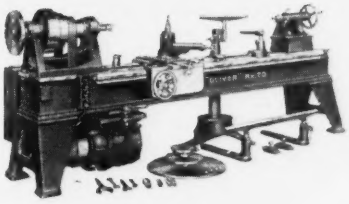
Statement required by the Act of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233) showing the ownership, management, and circulation of FOUNDRY, published monthly, at Cleveland, Ohio, for October 1, 1955. 1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The Penton Publishing Company, 1213 West Third St., Cleveland 13, Ohio. Editor, Frank G. Steinebach, 1213 West Third St., Cleveland 13, Ohio. Managing editor, William G. Gude, 1213 West Third St., Cleveland 13, Ohio. Business manager, George A. Pope, 1213 West Third St., Cleveland 13, Ohio. 2. The owner is The Penton Publishing Company, 1213 West Third St., Cleveland 13, Ohio. Names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock: Edwin C. Barringer, Washington, D. C.; Mrs. Penelope S. Beatty, Shaker Heights, Ohio; Conbat Co., Santa Barbara, Calif.; Cornom & Co., Cleveland, Ohio; J. R. Dawley, Cleveland, Ohio; Mrs. Agnes T. Hays, Cleveland, Ohio; George O. Hays, Cleveland, Ohio; Russell C. Jaenke, Cleveland, Ohio; A. L. Klingeman, Cleveland, Ohio; John D. Knox, Cleveland, Ohio; Parness & Co., Cleveland, Ohio; J. D. Pease, Sr., Mount Dora, Florida; Francis O. Rice, Cleveland, Ohio; Margaret L. Shaner, Cleveland, Ohio; Charles J. Stark, Cleveland, Ohio; Penelope M. Stark, Cleveland, Ohio; Wean Engineering Co., Inc., Warren, Ohio; Mrs. Leona F. Weber, Pittsburgh, Pa.; Grace Whelan, Santa Barbara, California. 3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are New England Mutual Life Insurance Co., 501 Boylston Street, Boston 17, Mass. 4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner. George A. Pope, Business Manager. Sworn to and subscribed before me this 30th day of September, 1955. (Seal) Joseph P. Lipka, Notary Public. (My commission expires September 9, 1958)

OLIVER

No. 20 Wood Lathe cuts large patterns with ease



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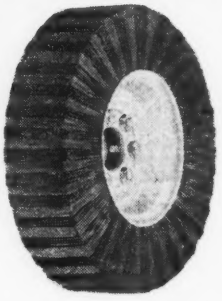

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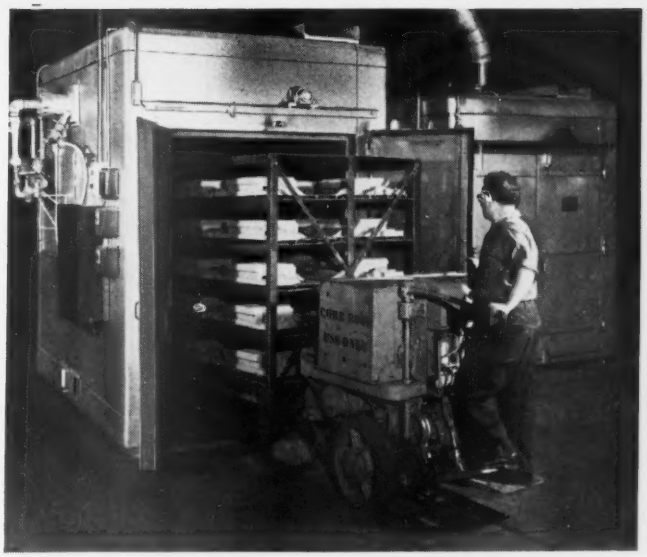

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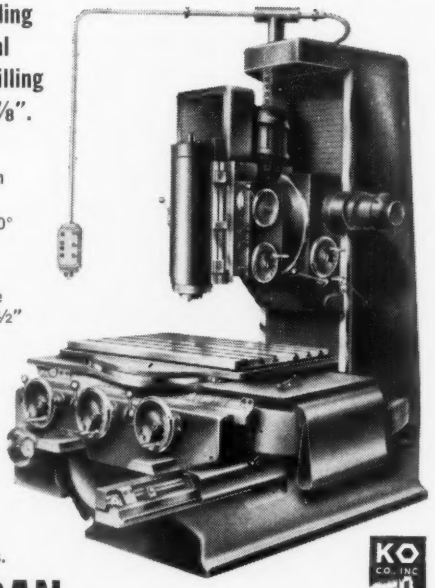

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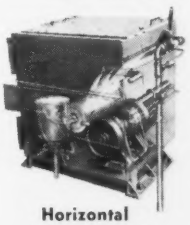

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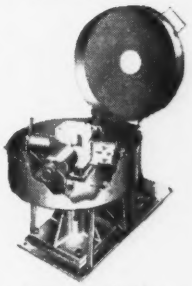

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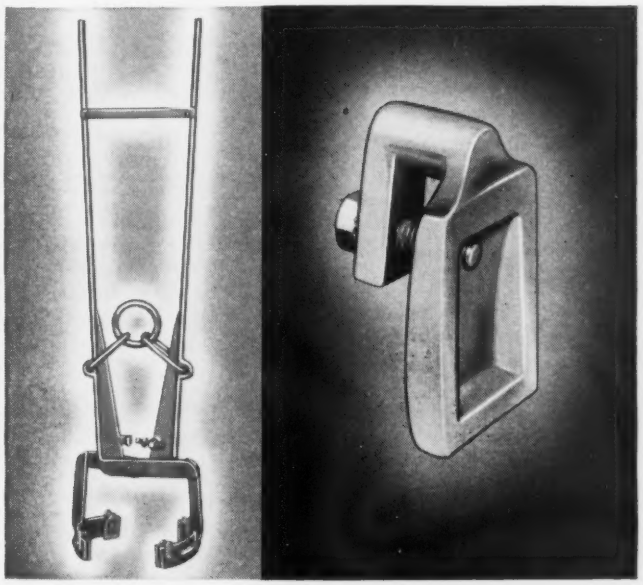

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Experienced estimating engineer for work in a nonferrous foundry. Located in Massachusetts. Must be familiar with sand casting process. Address: Box 740, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CONTROLLER

Foundry cost accounting experience required. Relocate upper New York State. Salary up to $12,000. ALEXANDER SERVICE (Agency) 122, East 42nd Street, New York City, MU 7-7815.

Help Wanted

DESIGNERS—DRAFTSMEN—ENGINEERS

Experienced in foundry layouts and equipment. Age 30-45. Send experience record, personal data, recent photo and references.

BOX 730, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

Want competent cast iron foundryman with understanding of iron, sand and molding, machine and floor type work. State salary, references and experience. Apply:

WARREN FOUNDRY & PIPE CORPORATION
183 SITGREAVES STREET
PHILLIPSBURG, NEW JERSEY

MAINTENANCE FOREMAN

To take charge of rebuilding shop. Must be familiar with all types of foundry equipment, experienced in supervision of personnel and shop organization. Position offers high salary and secure future in pleasant Pennsylvania community. Send resume of experience and personal background.

BOX 748, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

ENGINEER

Gray iron foundry Great Lakes Area producing light to heavy castings in pits, molds, rollovers and squeezers. We need high quality man with administrative and executive abilities who can work into a top management position carrying heavy responsibility and corresponding financial return. Address: Box 755, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

Technically trained Metallurgist with ferrous and nonferrous experience. To take full charge of an exclusively shell mold casting operation located in northern Ohio. An excellent opportunity to get in on the ground floor with a fast growing small company. Submit detailed application including training, experience, references, age, and salary. All replies treated confidentially. Address: Box 746, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN—PERMANENT MOLD

Qualiffed to supervise permanent mold work in expanding Eastern foundry. Must have sound background in field and the ability to handle men and assume supervisory responsibilities. MUST BE COST CONSCIOUS. Address: Box 751, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MOLDING FOREMAN OR ASSISTANT

Mechanized Midwest foundry wants aggressive foreman for molding department. Give personal history, references, and salary. Address: Box 708, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

For well established, financially strong, malleable casting foundry in the East, employing 250 men. To be in charge of air furnace batch type melting, sand control, and other details assisting plant manager. Write personal data, salary desired and resume of experience. Address: Box 737, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GENERAL FOREMAN CLEANING ROOM

Large eastern steel foundry has an excellent opening for a general foreman cleaning room. In reply give age, experience, references, and salary desired. Address: Box 714, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Man experienced in all phases of foundry practice. Capable of taking charge of a large ferrous foundry as general superintendent. Man with steel experience preferred. Address: Box 745, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

FOUNDRY SALES ENGINEER

Experienced in various phases of foundry practice to cover Indiana and Western Michigan for long established foundry supply company. Liberal drawing account and commission. Give complete details as to personal history, foundry and sales experience. All information held in strictest confidence. Address: Box 734, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD FOREMAN

To take charge primarily of mold preparation operations. Must be good mechanic and thoroughly familiar with coating techniques. Must be able to supervise and teach men. Foundry located in New Jersey. Excellent opportunity for top-notch man. Address: Box 750, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

MATURE BUSINESS MANAGER

Invites opportunity to stabilize going business and train logical future manager. Successfully managed five companies—three taken out of the red. Trained two successors, both made good. Qualified to handle complete administrative responsibility and develop all profitable possibilities. Excellent experience foundry, machine and related lines. Address: Box 753, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

AMBITIOUS YOUNG EXECUTIVE

With well rounded experience in all phases of foundry operations and management. Experienced as foreman, foundry engineer, superintendent, and manager. Excellent recommendations. Available immediately. Address: Box 759, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ENGINEER

M.E., age 27, married. Widely varied postgraduate training and experience in foundry and related industry. Capable writer. Desire location in small to medium production foundry. Address: Box 749, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumbers supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 744, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

Gray iron or malleable molding preferred in northern Illinois or southern Wisconsin. Twelve years' molding experience, 14 years' supervisory. Presently employed. Address: Box 707, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EXPERIENCED PRACTICAL FOUNDRYMAN

on both steel, iron and manganese steel. Have been general foreman, superintendent and consultant. Can furnish the best reference. Address: Box 694, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT OR MANAGER

Twenty-two years' practical experience, ferrous and nonferrous, production and jobbing. Well versed in all modern practices. Capable of taking complete charge all foundry operations. Past 15 years as foreman, superintendent and manager. Complete resume education and past experience upon request. Address: Box 741, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SITUATION WANTED

Cleaning room foreman and inspector. Fifteen years' experience in gray iron, twelve years experience in metal pattern work. Address: Box 754, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT FOREMAN

Desire position in gray iron or nonferrous, jobbing or production. Well versed in all phases of foundry operation. Practical and Technical. Fifteen years in supervisory positions, available immediately. Address: Box 752, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Thoroughly experienced in the management of gray iron production or jobbing foundries. Qualified to show you a highly efficient and low cost operation. If you are interested, Address: Box 703, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANUFACTURERS' REPRESENTATIVES

Lines wanted by two metallurgists selling ferrous and nonferrous foundry trade in Ohio, Indiana and Kentucky. Address: Box 733, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS.

Confidential Inquiries Invited
From Employers and Qualified Applicants.
For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **HARRISON 7-8600**
JOHN COPE, DIRECTOR **220 SOUTH STATE ST., CHICAGO, ILL.**

SALARIED PERSONNEL

$5000-$30,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, P.O. BOX 674, MANCHESTER, VERMONT.

Representatives Wanted

SALESMEN

We want several live wire salesmen who are now working on salary and who think they could increase their earnings by selling on liberal commission. These men must have followings in industries buying master alloys and hardeners. Please give full details in your first letter, i.e., personal history, employment record, territory, etc. Your information will be held in strictest confidence. Address: Box 665, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALESMAN

New England States. Sales and service of equipment, supplies and binders. Write giving full particulars, including education and foundry experience. Address: Box 736, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Consultants

FOUNDRY CONSULTANT CORE & MOLD BLOWING

Utilize the latest in conventional and shell CORE BLOWING METHODS to off-set present high costs and competition by use of: Existing Equipment when Possible—Improved Equipment Design—Improved Methods and Standards—Training of Supervision and Personnel. For CONSULTING SERVICE CONTACT: Box 716, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CONSULTANT

Specializing in quality control by installing the correct techniques for centrifugal casting, permanent molding and sand molding of brass and bronze castings. Address: LEIGHTON M. LONG, TONTOGANY, OHIO, PHONE TONTOGANY 3065.

Foundries For Sale

FOUNDRY FOR SALE

Brass foundry and machine shop, manufacturing marine hardware, propellers and fire fighting equipment in Vancouver, Canada. Good opportunity of securing a going business. Address: Box 742, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SMALL FOUNDRY FOR SALE

Well-equipped foundry in Eastern Pennsylvania. Has overhead crane, cleaning equipment. Plenty of adjacent land. On railroad. Address: Box 739, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOR SALE

Small nonferrous foundry in operation; Southern Ohio, or would consider partner. Address: Box 758, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry For Lease

FOR LEASE

Aluminum sand foundry completely equipped. 35,000 sq. ft. of floor space, located in small Missouri town with good transportation and labor supply. Address: BERKLEY JONES, 320 N. 4TH STREET, ST. LOUIS 2, MISSOURI.

Wanted-To-Buy

WANTED

OSBORN ROTO-LIFT
MOLDING MACHINE
MODEL NO. 3161

PEORIA MALLEABLE CASTINGS CO.
PEORIA, ILLINOIS
PHONE 2-5401

FOUNDRY MACHINERY COMPANY WANTED

We want to buy for cash for our program of diversification a company manufacturing foundry machinery.
Company should have 50 to 300 production workers.
We are not now engaged in this field.
All replies kept confidential.

Jerome K. Jellin, Chairman
Board of Directors
JASON INDUSTRIES, INC.
505 WALNUT STREET
CINCINNATI 2, OHIO

WANTED

45" and 55" lifting magnets, any condition.

call or write:
ERIE ELECTRIC CO., INC.
120 CHURCH STREET
BUFFALO 2, N. Y.
TELE:
CLEVELAND 4758.

WANTED TO BUY

1—Shakeout 4' x 6'
1—Set 2000# Dial Type Scales
1—36" Double Head Vertical Boring Mill
1 to 4—500# Iron Capacity, 1 man pouring ladles
1—Combination Coke and Sand Car Unloader

DEWEY BROS., INC.
GOLDSBORO, NORTH CAROLINA

MACHINERY WANTED

Screens, Simpson Mixers, Riehle Compression Testing Machines, Pulverizers, Grinders. Conveyors. Address: INSTRUMENT SERVICE COMPANY, INC., HOBOKEN, NEW JERSEY. BA 7-0600.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

MOTORS — GENERATORS
TRANSFORMERS

Unused — Rebuilt
WORLD'S LARGEST INVENTORY

ELECTRIC EQUIPMENT COMPANY
Phone Station Collect GLenwood 6783
P. O. Box 51 — Rochester 1, New York

FOR SALE

780 CFM Ingersoll Rand XLE 125 HP, 440 Volt. New 1953, air compressor. Like new. Address: **DARIEN CORP., 60 EAST 42ND STREET, NEW YORK 17, N. Y.**

For Sale

WE ANNOUNCE THE OPENING OF OUR MACHINE REPAIR SHOP SPECIALIZING IN REPAIRING AND REBUILDING FOUNDRY EQUIPMENT
FOUNDRY EQUIPMENT AVAILABLE—IN STOCK

Jolt Squeeze Strip Pin Lift Molding Machines
2 #724 PJ Osborn; 38" x 56" table; 28" squeeze cylinder; 11" jolt cylinder; 10" draw with hopper; 9" squeeze stroke; 4000 lb. cap. new in 1948; excellent condition; extra large size.
1 #163 Milwaukee—Table size 16" x 28"; actual capacity 16" x 44"; frame lift type; 1500 lb. capacity; also #143 and #183 Milwaukees.
1 Nicholls—Type B; 1945 machine; 14" cylinder; 14" x 36" table.

Jolt Rollover Molding Machines
1 #918 Johnston & Jennings—44" x 54"; 18" draw; no pit required.
1 International—Type G; Table size 30" x 12"; 1942 machine. New rings and new gaskets; excellent condition.
1 International—Type F; Table size 31" x 12".
3 Osborn Power Rollovers—Model 2047-4; Cap. 18" x 24"; stationary; 1942 machines.
2 Osborn #601; 750 lb. jolt capacity; 30" overall flask length.
1 Osborn #602; 750 lb. jolt capacity; 36" overall flask length.
1 Osborn #605; 750 lb. jolt capacity; 54" overall flask length.
1 SPO—Model #914; 14" cylinder; 30" capacity.

Jolt Squeezers
1 Nicholls Type D Jolt Squeezer.
2 Osborn #275 J Jolt Squeezers; table size 16" x 20"; 10" squeeze cylinder diameter.

Push Off Machines
1 Champion Push off machine; Model LLA-45; table size 45" x 26"; used with sand slinger.
1 International Push off machine; Model LP—Portable pin lift; used with sandslinger.

Core Blowers — Core Rollovers — Core Draw Machines
2 #193 Osborn — for medium sized cores; equipped with air operated draw pistons.
1 #94 Osborn—for large cores.
2 Osborn Hand Rollovers—Model 42; table size 14" x 20½"; maximum width of Core Box —22".

Material Handling Equipment
2 Model HA Hough Payloaders—Rebuilt.
2 Clark Fork Lift Trucks—6000 lb. Capacity.
2 Lewis-Shepard Platform Lifts—6000 lb. capacity.
1 Baker Raulang Fork Lift Truck—6000 lb. with ready power unit.
1 Elwell Parker Fork Lift Truck—6000 lb. with ready power unit.
1 Yale Fork Lift Truck—6000 lb. with ready power unit.
1 Mercury Fork Lift Truck—2000 lb.—Electric.

Furnaces
1 Stroman 2000 lb. Tilting Hydraulic; New in 1944.
1 Fisher 2000 lb. Type MNP: new in 1944.

Core Ovens
2 Dielectric—Model 900A and 1800A.

Miscellaneous Foundry Equipment
2 U. S. 7½ HP 3 speed grinders; 28" wheel.
1 #50 Beardsley & Piper Speedmuller.
2 Model S Beardsley & Piper Screenerators.
1 Climax Wire Straightener—#2; capacity $\frac{1}{16}$" to ¼"; Ser. CWS 600-44.
1 Plating Generator — Serial #31616 — Type EP-35.
2 Lester Die Casting Machines—Model 7B.

FOR THE BEST DEAL CALL
BALCHER MACHINERY COMPANY
6020 EUCLID AVENUE
CLEVELAND 3, OHIO
TELEPHONE: EXPRESS 1-8930

FOR SALE

1—FS 347 Ingersoll-Rand Centrifugal Foundry Blower, Serial No. S-347L3, complete with motor. Intake volume 4000 cfm.
1—Type G Ingersoll-Rand Centrifugal Foundry Blower, Serial No. 16G1415D8, complete with motor. Intake volume 2200 cfm.
1—#5½ Roots-Connersville, Figure 8, Impeller Type Foundry Blower, Serial No. 30642, designed for 28.2 cubic foot per revolution at a maximum speed of 220 RPM, without motor.

For further specifications, write

BEDFORD FOUNDRY & MACHINE COMPANY
1108 FIFTH STREET
BEDFORD, INDIANA

FOR SALE

Lectromelt 250 lb. Type "U" Side Charge Electric Furnace—Complete —Good Condition.

BEAVER VALLEY ALLOY FOUNDRY CO.
MONACA, PENNSYLVANIA

For Sale

FOR SALE
TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
8375	20oz.	Spencer	340	20oz.	A-B
6000	32oz.	Ing.-Rand	320	12oz.	Spencer
4700	32oz.	Ing.-Rand	250	12oz.	No. Am.
2700	16oz.	Spencer	9000	6"SP	Northern
2500	7 oz.	Sturt.	4200	8½"SP	Buffalo
1150	20oz.	No. Am.	3420	8"SP	N.Y.
800	13oz.	Buffalo	2700	⅝"SP	Ilg
500	12oz.	Buffalo	2500	½"SP	American
380	16oz.	No. Am.	2344	2"SP	Clarage
			1100	4½"SP	Bayley

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE.
CLEVELAND 14, OHIO

SAND BLAST EQUIPMENT
WE • BUY • SELL • TRADE

15" Continuous Wheelabrator $4,500.00
48 x 48 Wheelabrator Tumblast 5,000.00
42 x 48 Wheelabrator Tumblast 2,500.00
36 x 42 Wheelabrator Tumblast 3,000.00
27 x 36 Wheelabrator Tumblast 2,500.00
12' American Plain Table 5,000.00
8' American # 2 Table 8-28" Aux. 2,500.00
Pangborn 6' L.G. Table 2,500.00
Pangborn ES-421 Shell Blasting Machine 3,500.00
Hand cabinets and dust collectors all types and sizes—reasonable.

ATTENTION CANADIAN BUYERS
We still have two 42 x 48 Wheelabrators in Canada. These can be purchased duty free. Priced at $2,500.00 and $3,000.00. Excellent condition. Also 42 x 48 Wheelabrators in Detroit need Repair at $950.00 and $1,500.00.

DIAMOND SAND BLAST
5654 West Jefferson
Detroit 9, Michigan
Phone: Vinewood 3-6750

FORK LIFT TRUCKS

Slightly used, but in like new condition.
CLARK, TOWMOTOR AND ROSS.
Capacity 2,000 to 10,000 lbs.

. . . .

3,000 to 4,000 lb. Clark and Towmotor, solid rubber tires....$1,245.00

BEN WINER TRUCK AND EQUIPMENT
591 NORTH MAIN STREET
AKRON, OHIO
FRANKLIN 6-9246

FOR SALE
MC LAUGHLIN ELEVATOR

Winding drum machine. Installed in 1947. Used 4 months. Travel-20 ft. capacity 4,000 lbs. Speed 60 ft. per minute. Motor 10 H.P. 550 volts—3 phase—60 cycles. This can be bought cheap. We must move it.

CALL-WIRE-WRITE
COOK TRADING CORP.
36 COOK STREET
EAST BRIDGEWATER, MASS.
TEL. E. B. 8-3133

FOR SALE

Despatch gas fired core baking oven complete with electronic control. Double chamber, inside measurements each side 5'-3 wide x 13'-4 deep x 7'-7 high.

Sutorbilt positive pressure blower with anti-friction bearings. Size 16 x 43, 15 C.F. per rev., 3 lb max. pressure, normal max. RPM 325.

Other gray iron foundry items

VIERLING STEEL WORKS
53 W. JACKSON
CHICAGO 4, ILLINOIS
HARRISON 7-7550

FOR SALE

Simpson 3C Sand Mix Muller, 8 ft. diam. pan, standard mullers, 2 door discharge. Falk herringbone speed reducer for motor drive. 35 HP required. Serial No. 12317. Inventory of repair parts available.

CLARK EQUIPMENT COMPANY
BUCHANAN, MICHIGAN

FOR SALE

Capacitor banks. Free power study establishes savings. Lowest cost, using new government surplus. Guaranteed. Individually-fused. Non-flammable. All voltages, sizes. Specialist arc furnace applications. Will finance. Address: **T. STARLING WINTERS, ENGINEER, BOX 9, ENGLEWOOD, N. J.**

For Sale

FOR RENT OR LEASE

MODERN CONVEYOR FURNACE BARGAINS
All Used Less Than One Year!
BRIGHT ANNEALING: 16" w, 22' l, 7" h muffle. GF. Never used.
BRAZING: 100 KW 18" w, 10' l, 10" h. Complete with dryer, generator, controls.
HARDENING: 800 lbs/hr. 24" w, 13' l, 6" h. 78 KW. Never used.
TEMPERING: 900 lbs/hr. 17" w, 24' l, 15" h recirc. GF.
Also Salt Baths, Atmosphere Generators, Quenches.

FOR RENT OR LEASE

CARBURIZING FURNACE BARGAINS!
Never used Ipsen Carbonitriding Furnace.
Model TC 300 E. Also rebuilt T250.
L & N Homocarb, 24" dia. 36" deep.
S. C. pusher, radiant tube, 34" w, 25' l, 15" h.
S. C. Shaker Hearth, 24" w, 100"l, 7" h.
Please call collect or drop a card for our complete list of heat treating, melting and metal finishing machines.

METAL TREATING EQUIPMENT EXCHANGE
9825 GREELEY, DETROIT 11, MICHIGAN
TOwnsend 8-8450—Please call "collect"

FOR SALE
SAND BLAST MACHINE

1—Pangborn Corp. (Hagerstown, Md.) year 1936 type LG multispindle rotoblast 9' table special sand blast machine #127362—with type IC-3-14' elevator and 2'6" x 2'6" x 5'6" sand hopper—full motor drive Texrope main drive—32" centers—9" x 7"—5 groove sheaves ⅝" x $\frac{7}{16}$" belts—steel guard 1 Texrope elevator drive—11" centers 18" x 3½"—5 groove sheaves ½" x ⅜" belts 1 Texrope elevator drive—21" centers 18" and 6" 6-groove sheaves ⅝" x $\frac{7}{16}$" belts. New blasting head installed in 1944. Baskets holding work are diam. 28" cl. under door 10". 9 baskets make a complete revolution under the blasting head in 1 minute 40 seconds. CALL—WIRE—WRITE—COOK TRADING CORP., 36 COOK STREET, EAST BRIDGEWATER, MASS. TEL. E. B. 8-3133.

FOR SALE
HOUGH PAYLOADERS

Model HA new in 1953. Complete overhaul by factory agency in July 1955 and has not been used since. With practically new tires. A good buy at $2,000.00 F.O.B. Toledo, Ohio.

THE ENSIGN FOUNDRY CO.
TOLEDO 6, OHIO

STEEL MELTING FURNACE
Detroit Rocker

1—350 lb. cold charge, never used, Cost $10,000. will sacrifice for $5,000
1—60 lb. cold charge, slightly used, $1,500
Both units have spare shells complete with electrical panels and disconnect switches. Transformers wired for 220 volts, 60 cycle primary.

FALLON INDUSTRIES,
25800 GROESBECK HWY.
ROSEVILLE, MICHIGAN
PRESCOTT 7-2500

FOR SALE

1—Tinius Olsen 100,000# Universal Compression Testing Machine
1—Magnaflux Demagnetizing Unit
Simpson Sand Mixers 18" dia. Laboratory #0, #1, #1½, #2, #3.
Miscellaneous: Screens, Pulverizers, Grinders, Conveyors—all types, Tyler Rotap Screens, etc.

OUR 38th YEAR

CONSOLIDATED PRODUCTS CO., INC.
66 BLOOMFIELD STREET
HOBOKEN, NEW JERSEY
HO 3-4425 N.Y. TEL. BA 7-0600

FOR SALE

3—Osborn Cope Molding Machines—Type 716 P.J.
3—Osborn Drag Machines—Type 332-49
1—Link Belt Mold Conveyor with 98 cars
8—Molding sand overhead Hoppers

ALBION MALLEABLE IRON COMPANY
ALBION, MICHIGAN

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

FOR SALE

MOLDING MACHINES

1—Herman, Jolt, Rollover Draw, 6000#, 40" x 60" table.

2—International, Jolt, Rollover Draw, 24" x 10G, Stationary.

2—International, Jolt, Rollover Draw, 20" x 8-G. Portable.

1—SPO #305 Jolt Stripper.

2—No. 275 Osborn jolt squeezers. Stationary.

1—#276 Osborn Jolt Squeeze. Stationary.

CORE OVENS

1—Coleman Recirculating 3 section with 5 drawers per section. Gas fired.

1—Coleman Recirculating 4 section with 5 drawers per section. Gas fired.

BLOWERS FOR CUPOLAS AND FURNACES

1—Connersville Rotary Blower, 3500 CFM.

2—Spencer Turbine, 30 HP, 3000 CFM, 24 oz.

2—#7½ Roots rotary blowers—27 x 81—14000 CFM.

2—Connersville Rotary 14" x 27" HD, 2750 CFM at 5# press.

1—Connersville rotary blower 22 x 66 45 cu ft per revolution 9000 CFM.

Maxon-Premix Blowers for Gas ¼ to 1 HP.

2—5 HP 20-oz. Spencer Turbine Blowers.

2—2 HP 20-oz. Spencer Turbine Blowers.

2—Spencer Turbine Blowers, 3000 CFM, 24 oz., 30 HP, 3/60/220-440 V.

METAL MELTING EQUIPMENT

1—1000# open flame brass melting furnace, gas fired.

1—Hausfeld Stationary Brass, oil or gas burner, 2000# cap.

1—Hausfeld Tilting crucible, gas, 250# Al, Cap.

1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.

MISCELLANEOUS

1—Beardsley & Piper Model S Screenerator.

1—Pangborn 1 to 4 nozzle air blast generator, complete.

1—Sullivan, 2 stage compressor, 14-8¾ x 10, 75 HP.

1—Sly Tumbler 24" x 40".

1—International SB-11 core blower.

2—Pangborn cloth screen collectors, 2 HP.

1—Stoney crane type shakeout.

1—NC-4 Royer sand separator.

1—#1 Demmler core blower.

1—#16 Roto-clone unit complete.

Complete stock of rebuilt mill and dust exhaust blowers.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

TREMENDOUS VALUE—ALMOST NEW CORE OVEN—PRICED AT LESS THAN HALF REPLACEMENT COST

"DESPATCH TOWER" (75 FT. HIGH) CORE OVEN, SERIAL #21548, COMPLETE, DISMANTLED, WITH THE FOLLOWING SPECIFICATIONS:

Maximum temperature—500° F.
Average baking time—4 hours.
Output—Approximately 5 racks per hour.
Rack dimensions—36" x 102" x 26" high, overall.
Total number of racks—27 (20 racks in the oven at one time)
Rack capacity—400 lbs.
Heater—"Despatch" direct gas, 1,500,000 BTU per hour (Heater is externally mounted)
Combustion equipment—"Eclipse" atmospheric type
Electric current specs:
Motors—440/220 v. 3 phase 60 cycle
Controls—110 v. 1 phase 60 cycle A.C.
Fuel—Natural gas, 6"—8" W.C.

THIS OVEN IS LIKE NEW—IN USE ONLY THREE YEARS.

A complete set of drawings, including one assembly drawing and twenty-eight related drawings, is available upon request.

PRICE—A BARGAIN AT $20,000.00

For further information, please contact Mr. Don Kelker, Purchasing Agent or Mr. Don Smith, Plant Engineer.

THE DURIRON COMPANY, INC.
DAYTON, OHIO

FOUNDRYMEN....SAVE UP TO 50%

Immediate Delivery of Good Used Foundry Equipment—Rebuilt—Guaranteed

LINK BELT MS-90
For moving BIG castings FAST

BALERS
LOGEMANN Hyd. Oblique, Scrap Metal, Chamber: 18" x 84" x 36", Bale size: 18" x 8" x 8"—12"

BLOWERS
WHITING Cupola 9800 cfm, 1.25G (2)
ROOTS CONNERSVILLE 16 x 16 x 8 x 16, 1000 cfm @ 9 PSIG (2 each)
SPENCER Gas Booster, 2000 cfm, 48 oz.
GENERAL ELECTRIC Compressor Blower, 16000 cfm, 1.25
ALLIS CHALMERS 107.5 cfm, 10# press, 7½ HP
ALLIS CHALMERS 894 cfm, 10# press, 60 HP

BUCKETS
CLAM SHELL 2 yard
BLAW KNOX single line #319E
KEESLER 1½ yard Clam Shell

CASTING MACHINES
KERR Model 180, Lab Type
CENTRIFUGAL #AS, 4' dia. chamber

COMPRESSORS
SULLIVAN, air cooled, 325 cfm, 125#
SULLIVAN, water cooled, 536 cfm, 125#

CORE MACHINERY
FEDERAL Sand Core Blower
WESCO Pneumatic Core Blower, 12" x 27" x 6" lift
MILWAUKEE Hyd. Core Maker, 24" x 24"
COLEMAN Gas Fired Oven, 50°—800° F.; 84" x 82½" high x 13' long
DRYING SYSTEM Gas Fired Oven, 300°, 14'-6" x 14'-0" x 7'-4"; Completely equipped with heater, fans, ducts, motors & controls

CRANES, MOBILE
LINK BELT MS-90 60' Boom, 20 ton cap., pneumatic tires
KOEHRING 24' Boom, 10 ton cap., solid tires
LINK BELT, 23' Boom, 10 ton, solid tires
BYERS, 30' Boom, on rubber, ⅝ yard cap.

CRANES, OVERHEAD
P & H Double Girder, 2 ton, 28'-5½" span
SHEPARD 5 ton, 40' span, 20" beam
SHAW BOX 3 ton, 38'-4" span
MARIS 5 ton, 18'-2" span
NORTHERN 10 ton, 43' span, DC*
NORTHERN 6 ton, 43' span, DC*
*Designed for foundry; new condition

DEBURRING MACHINES
3" Spindle; 18" x 29"

DUST COLLECTORS
ROTOCLONE, Type D, 14"

FORK LIFT TRUCKS
3—CLARK 6000# Utilitruc
6—CLARK 4000# Carloader, Gasoline
1—LEWIS SHEPARD 4000#
1—CLARK 2000# Clipper, Gasoline

GRINDERS
GARDNER 53", Hor. Disc
SAFETY SPEEDRITE, 30" Snag, 30 HP, Dbl. End
BESLEY 30", Double Opposed
GARDNER 30" Disc
FOX Swing, 24", 6' swing
BESLEY 10"

MAGNETS
CUTLER HAMMER 15 x 36, 220 V
Circular Lifting, 55", 45", 39", 36", 25"
STEARNS Magnetic Pulley, 12" x 24"

SAND CUTTERS
JEFFEREY, Type D, Class 1, Form A; 18" x 24"; ⅜" x 1" mesh

SANDBLAST EQUIPMENT
AMERICAN 8' wide x 8' high x 10' long
RUEMELIN Cleaning Cabinet, hand type, 60" x 36"

SPECIAL OFFERING BEFORE REMOVAL
Can Be Seen Under Power
AMERICAN WHEELABRATOR
Table Blast Machine
Model No. 3. With four (4) 48" dia. tables
Complete with sand return system
EXCELLENT CONDITION
$2250 As Is, Where Is

SCALES
Platform, 30 ton, 9' x 30'
Crane, 20 ton FAIRBANKS

SHEARS
CANTON No. 3 Alligator

SPRUE CUTTERS
FERRACUTE ¾" cap., 5 HP Master, Mod. 12356
OVERMAYER Punch Press, 10" throat, 1¼" stroke

STRIPPERS, MOLDERS
MILWAUKEE, 54" x 54", Air, 6000# Jolt Rollover, Model 60A
OSBORN No. 147, 40" x 24", Air, Draw Core Rollover
CHAMPION 33" x 55" x 40"
OSBORN 24" x 30", Air, 10" Draw, Portable Jolt Rollover
OSBORN No. 2047-4, 22" x 30", Air, Jolt Rollover
MILWAUKEE, 21" x 27", Model 126-3 Jolt Squeeze
OSBORN, 20" x 22", Air, 8" Draw, Rollover
OSBORN No. 332-35, 18½" x 25", 5 ton
TABOR 18" x 26", Bench Type

TRACTORS, ENDLOADERS
OLIVER OC-3 Crawler, ½ yard bucket; New
HOUGH Endloader, ¾ yard

MACHINE TOOLS, ELECTRIC MOTORS & CONTROLS, CONVEYORS

Complete Rebuilding Facilities

WRITE — WIRE — PHONE ROCKFORD 2-7721

JOSEPH BEHR & SONS, INC.

1156 Seminary Street **Rockford, Illinois**

The BIG NAME in Foundry Equipment presents:

SELECT LISTINGS FROM OUR GUARANTEED STOCK

BLOWERS
1—85 HP G.E. Cupola Blower, 24 oz.
3—7½ HP FISHER, 16 oz.
15—CENTRIFUGAL BLOWERS, 350 CFM to 10,500 CFM.

CLEANING EQUIPMENT
1—AMERICAN #1MULTITABLE, 6 aux. tables 15", main table 45".
1—ROBBINS SHAKEOUT 4' x 2'.
1—AMERICAN #2 MULTITABLE, 5 tables, 37" dia.
5—US GRINDERS, double end, 10, 15, 20 HP.
4—GRINDERS, Swing frame, 15 HP.
2—TUMBLING BARRELS, Cast Iron, 36" x 24" w/2 HP Motor.
2—TUMBLING BARRELS, Square, 34" x 48".
2—TUMBLING BARRELS, Side Tilt, 18" wide x 20" deep.

CONVEYORS
4—SAND ELEVATORS, various sizes.
1—STEEL PLATE MOLD, 90' centers, 30" belt, w/drive.
2—STEEL PLATE MOLD, 90' centers, 24" belt, w/drive.
6—SAND BELT CONVEYORS, 10' centers to 140' centers, 18" to 36" belt, complete w/drives and hoppers.
2—CASTING CONVEYORS, wire mesh, 18" x 32" w/drive.

CUPOLAS
1—WHITING, #3½, w/Skip Charger.
2—WHITING #6, Complete with Skip Charger.
1—MORRIS #9, w/skip, mixing ladle, never used.
1—WHITING #5, w/Blower & Air weight Control.
1—MODERN, #3, 46' shell, w/blower.
2—#11, with complete charging system, latest design.
1—SKIP CHARGER, 3 bottom drop buckets, scale for #9 cupola.

CORE BLOWERS
1—CB-400 CHAMPION. 1—3K DEMMLER.
6—#2 DEMMLER. 2—#2 REDFORD.
1—SB 13 INTL.

FLASKS & CORE PLATES
400 TONS, CAST STEEL, STRUCTURAL STEEL and STERLING TYPE FLOOR FLASKS—ALL SIZES.
20 TONS, FLAT STEEL and PERFORATED STEEL CORE PLATES. SEND FOR COMPLETE LISTINGS.
150—HINES & FREEMAN ALUM. Pop-offs and jackets, send for list.

FURNACES—DIRECT ARC MELTING
1—250#/hr. Hydraulic Top Charge.
1—500#/hr. MOORE.
1—1 Ton WHITING Top charge.
1—2 Ton SWINDELL, Top charge.
1—1000# SWINDELL.
2—3000# HEROULTS.
1—2 Ton HEROULT.
1—6 Ton HEROULT.

FURNACES—INDIRECT ARC
2—200# cap. DETROIT, complete.
3—350# cap. DETROIT, complete.
1—1000# cap. DETROIT, complete.
1—750# LFY DETROIT.
2—800# BAILEYS.
1—60# DETROIT, complete.

FURNACES—INDUCTION MELTING
1—20KW AJAX Spark Gap High Frequency, 17 lb. capacity in steel.
3—333 KW, AJAX-TAMA-WYATT, 1500# Alum.
1—30 KW LEPEL, 5# crucible.
1—3 KW AJAX, Lab. type.

FURNACES—OIL AND GAS
1—FISHER 4 Burner MNP, 1700#, gas.
3—WALKER YORK #400 cruc. tilting, coke fired.
1—SKLENAR 600#, Oil fired.
7—HAUSFELD 1000#, tilting, oil fired.
1—HAUSFELD Tilting, 1200# Mag.
1—R & S Convection Draw, Car bottom, 18' l x 8' w x 5' h, oil fired, dismantled, controls.

JUST PURCHASED
SPECIAL LOW PRICES BEFORE REMOVAL FROM LARGE EASTERN FOUNDRY!

NATIONAL ENGR. SAND SYSTEM w/2 #3 Mullers, elevators, conveyors, etc.
#6, #7, #8 WHITING CUPOLAS w/ Blowers and Foxboro Controls
Overhead Charging CRANES
BONDACTOR w/25 ton Hopper
8—CORE OVENS, rack & car type, Recirculating, Gas and Oil
48 x 48 Amer. Wheel TUMBLAST
48 x 72 Amer. Wheel TUMBLAST
both with SKIP HOISTS
40 x 50 TABOR ROLLOVER

MOLDING MACHINES
Jolt Rollovers
1—J & J #612, 24" x 30", 12" draw.
1—J & J #815, 30" x 40", 15" draw, 1200# jolt.
2—HERMAN 1500#, above ground.
2—HERMAN, 20" x 24", 750#.
1—HERMAN, 40" x 65", 3000#, short arm.
1—HERMAN, 40" x 59", 3000#, long arm.
1—HERMAN, 50" x 72", 6000# jolt.
1—HERMAN, 42" x 78", 6000# jolt.
1—OSBORN, #243, 27" x 40", 20" draw.
4—TABOR, 22" x 42", pattern draw, port.
1—SPO #506, 24" x 25", 10" draw.

Bumpers
1—OSBORN #102.
1—HERMAN, 60" x 72".

Jolt Strippers
9—DAVENPORT #30T, 30" x 30".
2—OSBORN #559, 25" x 30", 1200#.
4—MILWAUKEE #1536, 32" x 38".
4—SPO, 24" x 24".

Jolt Squeeze Strippers
1—OSBORN #175, 21" x 18", portable.
1—OSBORN #710J.
2—MILWAUKEE #163.

Jolt Squeezers
10—SPO 110J, Portable.
2—INTERNATIONAL, 17" x 20", port.
1—OSBORN #212 PJ, 17" x 23", stationary.
3—TABOR, 18" x 20", 3" jolt, column.
1—TABOR, 18" x 20", 3" jolt, cantilever.
1—ADAMS, 19" x 20", portable.

LADLES & POURING DEVICES
2—WHITING 3 Ton, Bottom pour.
4—10 TON BOTTOM POUR, 55" x 55".
2—45 TON TREADWELL, Excellent.
1—20 Ton lip Pour, 72" x 72".
1—SWINDELL, Elec. Holding.

MULLERS AND MIXERS
1—SIMPSON #1, late type.
2—SIMPSON #3, UNIT DRIVE.
1—SIMPSON #3, enclosed gears.
2—SIMPSON #2, Unit Drive.
2—CLEARFIELD #610 and #920.
1—BEARDSLEY & PIPER #60 SPEEDMULLER, 60 HP motor, SKIP-LOADER.
1—B & P #40 SPEEDMULLOR.

OVENS
1—TOWER CORE OVEN, 14" x 60" trays, 45' high, gas fired, dismantled.
2—ROSS 2 comp., rack, gas, 6½ x 14 x 7.
1—YOUNG BROS. 3 compartment, kiln type electrically heated, with CONTROLS.
1—YOUNG BROS. 2 compartment, drawer type, oil or gas, 82" h x 12' w x 6' l.

SAND CUTTERS
5—AMERICAN SAND CUTTERS.
1—MODEL "AA", 60" reel, Gas Driven.
1—MODEL "K", 72" reel, Gas Driven.
1—MODEL "F", 80" reel, Gas Driven.
1—MODEL "D", 76" x 96".
1—SANDMASTER, 70/102, New in 1950, Rubber Tires.

SAND LABORATORY EQUIPMENT
1—TEST CORE BAKING OVEN #606.

SAND PREPARATORS
2—B & P SCREENERATORS, size S & M.
1—REDDY SAND UNIT. HANDY SANDY.
2—JEFFREY SANDITIONERS, Portable.
2—ROYER SAND BLENDERS, 16" belt, 12" belt.
1—LINK BELT REVIVIFIER, Size 5.
2—B & P SAND CONDITIONERS, portable.
1—HETHERINGTON & BERNER SAND DRYER, rotary, oil fired #552.

SAND SLINGERS
1—BEARDSLEY & PIPER MOTIVE JR. 19" head.
1—BEARDSLEY & PIPER STATIONARY, 19" head, 8 ton plate feeder and hopper, NEVER USED.
1—BEARDSLEY & PIPER TRACTOR TYPE 16" head, magnetic separator.
1—PORTABLE SLINGER, 16" head, 4' long, on Truck.

TESTING MACHINES
1—TINIUS OLSEN, UNIVERSAL, 100,000# capacity.
1—TINIUS OLSEN, BRINELL HARDNESS, 3,000 KG.
1—RIEHLE, UNIVERSAL, 2 screw mechanical, 100,000# capacity.
1—ROCKWELL HARDNESS, #5JR with "C" Brail.
1—BALDWIN - TATE - EMERY, UNIVERSAL, Hydraulic tensile, 24,000#.

TRUCKS
2—HOUGH PAYLOADERS, Model HA, Hydraulic Trip.
2—BELL PRIME MOVERS, 1000# capacity, gas driven.

MISCELLANEOUS
6—PENN DUMP BUCKETS, 1000# to 4 ton.
4—CURTISS AIR HOISTS, barrel type.
1—HOFFCO Vacuum Cleaner, #75.
1—ALLEN-BILLMEYER Vacuum Cleaner, port.

UNIVERSAL MACHINERY AND EQUIPMENT CO.

1630 N. Ninth St., Reading, Pa. **Phone 3-1927**
320 E. Broad St., Shillington, Pa. **Phone 7-1321**

5 STEEL APRON CONVEYORS
1—120′ centers x 36″ wide Midwest
1—57′ centers x 30″ Palmer-Bee "Kantleak" variable speed.
1—44′ centers x 30″ wide Link-Belt
1—19′ centers x 30″ wide Palmer-Bee
1—5′6″ centers x 30″ wide Palmer-Bee

3 FLAT BELT CONVEYORS 2—30″ x 45′ x 110′, 1—36″ x 35′

SAND MULLERS, B-P #30 and #70
#1 Simpson.

CUPOLA 1—#3½ Modern

1 BELLEVUE ANNEALING FURNACE—Oil fired all controls, box type 36″ wide x 72″ deep x 24″ high, overall 69″ wide, 88½″ deep, 71″ high. Height clearance required 10′.

. . SPECIAL SALE . .

1 complete gray iron foundry, 18000 sq. ft., #7 Whiting cupola. R. R. Siding, in Belleville, Ohio, 10 miles south of Mansfield.

MISCELLANEOUS MOLDING MACHINES

2—Tabor 22″ x 32″ table, 10″ draw, 600 lbs. cap., air clamps.
4—International Type G, Air Rollover, Foot draw, 600#, size 24″ x 10″.
6—International Type RJ, size 20″ x 8″, Air jolt.
4—International Type R, size 20″ x 8″.
3—Champion Type W22″ and W16″, 12″ and 8″ draw, hand rollover.

Rollovers
Davenport
2—A40, 40″ x 64″ table, 3500 lbs. jolt, 24″ draw
2—SA40, 42″ x 50″ table, 3000 lbs. jolt, 18″ draw
1—SA28, 30″ x 40″ table, 1500 lbs. jolt, 12″ draw

Herman
1—40″ x 60″ table, 6000 lbs. jolt, 20″ draw

Osborn
1—405-95, 40″ x 64″ table, 3500 lbs. jolt, 26″ draw
2—342, 23″ x 38″ table, 1,000 lb. jolt, 12″ to 19″ draw

Pushoff: 1—Osborn 3′ x 16′ table.

Jolt Squeezers: J & J, Milwaukee, Osborn, SPO

Jolt Strippers:
2—Milwaukee, 900 lbs. jolt, 17″ x 21″ table, 6″ draw.
1—Davenport AJS34, 36″ x 46″ table, 2500 lbs. jolt, 12″ draw
4—Nichols Frame strip 42″ x 62″, 10000 lbs. jolt, 12″ draw
2—Herman 40″ x 60″ table, 6000 lbs. jolt, 20″ draw

Jolt Squeeze Pin Lift: 1—Milwaukee 145-1, 1700 lbs. jolt, 14″ squeeze cyl., 8″ draw, 25″ x 30″ table.
6—Milwaukee, 600 lbs. cap., 4″ draw, 17″ x 21″ table.
2—Osborn 814-P, 700 lbs. jolt, 8″ draw, 14″ squeeze cyl.
5—Osborn 720U, 600 lbs. jolt, 4″ draw, 11″ squeeze cyl.
2—Nichols 24-54D, 24″ squeeze piston, 1600 lbs. jolt, 8″ draw

Jolt Plain: 1—International Type J, 3000 lbs. jolt, 36″ x 48″ table.
1—International Type J, 10,000 lbs. jolt 76″ x 76″ table.

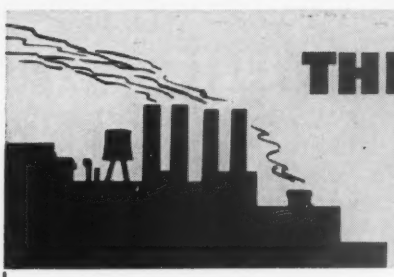
We carry all makes and types of foundry equipment in stock. Send for our complete listing.

OUR GUARANTEE
IF YOU ARE NOT SATISFIED WITH OUR EQUIPMENT, YOU MAY RETURN IT FOR A FULL REFUND.

We Buy and Sell One Piece of Equipment or Complete Foundries

Telephone . . . GLenville 1-1222

GUARANTEED FOUNDRY EQUIPMENT



THE ACME *bargain page*

AIR COMPRESSORS
Ingersoll Rand Type 10—14 x 9 x 12, 2 stage, 75 HP, 3/60/220/1200 rpm synchronous motor, 350 CFM at 100#.
5 x 5 Ingersoll Rand 10 HP motor.
Ingersoll Rand Type 10, 800 CFM, 2 stage air compressor, 200 HP, 220 V motor. This is an older unit. No starter or air receiver. Overhauled in 1951.
Sullivan Vertical Single Stage 100 HP air compressor, 220 volt motor, with starter and air receiver.

AIR HOISTS
8—4000# Ingersoll-Rand, with trolleys.

BLOWERS
Ingersoll-Rand Motor Blower Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220V G. E. Induction motor.
General Electric 7500 CFM, 20 oz., 89.6 Max. HP, 220V motor, Airway controls.
Ingersoll-Rand turbo compressor 10500 CFM @ 20 oz. 85 HP G. E. 220V 3500 CFM motor.

CLEANING EQUIPMENT
Sly 8′ dia. Table Shot Blast Unit.
36 x 42 Halloway 7½ HP shot motor elevator and dust collector.

CORE BLOWERS
3—International SB 12.
4—International SB 13.
12—Osborn 193.
1—Osborn 2035-2.
1—Peterson (Similar to Demmler #50).
1—Champion CB 400.

CORE OVENS VERTICAL HORIZONTAL
1—Coleman, combination oil or gas fired 43 carriers 24″ x 90″—1 hour 12 min. to 4 hours 48 min. cycle.
1—Coleman, combination oil or gas fired 43—2 shelf carriers 30″ x 144″ long. 2 hour 12 min. to 7 hour 24 min cycle. Present replacement cost over $90,000.

CUPOLA GUN
Bondactor, Model 1250

WE HAVE A LARGE STOCK OF NEW FLASK PINS AND BUSHINGS. TELL US WHAT YOU NEED. WE CAN SAVE YOU MONEY.

GRINDERS
Horizontal Disc (Flat) Grinders:
Gardner #186, 30″ dia. disc. 10 HP, 220/440V, with dresser, wet or dry grinder.
Gardner HV5A, 18″ dia., 7½ HP, 440V, with dresser.
Double End Disc:
2—U.S. 18″ wheels, 2 swing tables, 1 with lever feed.

GRINDERS, SNAGGING
4—Hammond 10 W R I Double End Snag. Grinders 20″ dia. wheels, 10 HP 220/440 V motors, variable speed drives.
2—3″ x 24″ U. S. #65, 20 HP 220/440V.

GRINDERS, SWING FRAME
2—3″ x 24″ x 12″ Fox #4, 15 HP.
1—3″ x 24″ x 12″ Marschke, 20 HP.
1—3″ x 24″ x 12″ U.S. 15 HP.

HOT METAL CARRIERS
3—1 ton D.C. Cab operated Cleveland, Monotractor Hot Metal Carriers.

MOLDING MACHINES
Jolt Squeezers:
7—Milwaukee 103-11 Staty. Jolt Squeezers, 13½″ x 20″ table.
7—Champion JS10P Portable Jolt Squeeze molding machine. 18″ x 21″ table.
8—Osborn 275J.
1—Spo 110J.
Jolt Squeeze Pin Lifts BIG
2—International PK 20's. 20″ squeeze cylinder 8″ draw. Ser. #67237. New 1949.
1—Osborn 712 PJ. Stationary Jolt Squeeze pin lift 18″ x 28″ table 12″ squeeze cylinder, 6″ draw.
2—Milwaukee Jolt Squeeze Strippers, Model 163-50, 15″ x 24″ table 16″ X open end pattern size.
1—SPO 214 Jolt Squeeze Pin Lift.
2—Milwaukee 126-3 Jolt Squeeze Pin Stripper, 27″ x 21″ table, 8″ draw. Portable.

ROLLOVERS
Jolt Rollover Pattern Draw
1—Herman 4000# Series 30″ x 60″ table, 32″ x 48″ bumper.
1—Herman 3000# Series 40″ x 84″ table, special slotted table.
1—Herman 1500# Series 20″ x 36″ table.
2—Herman 750# Series 20″ x 30″ table.
2—Herman 750# Series 20″ x 24″ table.
All the above have air clamps rollout tables.
2—Champion JM-18-8 Jolt Rollovers, portable 13½″ x 20″ tables.
1—Davenport 24 SA Jolt Rollover Pattern Draw. 26″ x 42″ flask size, 12″ draw.
3—Spo Model 9032.
1—Milwaukee 217.

JOLT PIN LIFTS:
Pin Lift Pushoffs:
2—Champion Pin Pushoffs 28″ x 42″ table 10″ draw.

MULLERS AND MIXERS
Simpson #3 Type H open gear type.
Beardsley & Piper #70 Speedmuller, New style cross head.

OVENS, MOLD OR CORE
Porbeck Double Car Single door 16′ long 14′ wide 9′ high gas fired 600° recirculating complete with 7½ HP car puller, in place St. Louis, Mo.
Core Oven Electric 68″ x 42″ high, 65″ deep 100°-650°

POURING DEVICES
3—Pouring devices, Whiting 500#.

PREPARATOR
B&P #70 Preparator. Only used 3 months.

SAND CUTTERS
2—Model M Screenarators.

ACME

ACME EQUIPMENT CO., INC.

We will buy for cash a single piece of equipment or your entire foundry

126 South Clinton Street • *Phone:* ANdover 3-3430 • Chicago 6, Illinois

MDNA

ELECTRIC melting furnaces

BUY FROM SPECIALISTS...LARGEST, MOST COMPLETE STOCKS

1—Swindell 8 ton 9′ diameter Shell Electric Furnace, 2500 KVA transformer, 13,800 or 11,000 V. In our Chicago warehouse.

1—Chicago 3000# Electric Furnace, tilt back head. 4" electrodes, 800 KVA, 12,000 V transformer. Complete. May be seen in place Chicago.

Ajax Northrup High Frequency Induction Furnace, spark gap type, 35 KVA with 60# and 17# melting pots.

1—Detroit Electric, 1500# capacity, 13,200 primary voltage. Kuhlman transformers. Complete with controls.

Detroit Electric 350#, Type LFA with Kuhlman transformers and oil circuit breaker, 13,200 primary voltage.

Pennsylvania 1500 KVA transformer, 12000 V. Never used since rebuilt. With complete controls, mostly new, needed for operation of a furnace. New control panel, Field Rheostat, 25 HP, 440 V MG set.

1—1500 KVA G. E. Transformer with taps for 11,000 or 13,800 volts.

Transformers—2—2500 KVA furnace transformers, 11,000 or 13,800 primary voltage.

ACME

ACME EQUIPMENT CO., INC.

We will buy for cash a single piece of equipment or your entire foundry

126 South Clinton Street • *Phone:* ANdover 3-3430 • Chicago 6, Illinois

MONA

BUILDING SOLD

MUST VACATE BY NOVEMBER 15
NO REASONABLE OFFER REFUSED

AIR COMPRESSORS:

Ingersoll-Rand, Type 10, 16″ x 20″ x 12½″, 2 stage, 206 HP 220V starter and receiver rebuilt 1952.

Ingersoll-Rand, Type 10, 800CFM, 2 stage, 200 HP, 220V. Overhauled in 1951.

Sullivan vertical single stage 100 HP, 220 V motor starter and receiver.

4—OVERHEAD ELECTRIC TRAVELLING CRANES:

40′ Spans, 22′ Lifts, 220V, A.C.

1—Milwaukee 10 ton. Drum type controls.

1—Northern 5 ton. Drum type controls.

1—Northern 5 ton. Lever controls.

1—Whiting 5 ton. Drum type controls.

600 feet Runway with knee supports.

CHICAGO STEEL FOUNDRY CO.

3720 South Kedzie Ave. • Phone—ANdover 3-3430 • Chicago, Ill.

111 SOLD – 83 STILL AVAILABLE

AIR BLOC HOISTS

TODAYS COST $475.00

In Lots of 3 **$125.00 EACH**

INCLUDING but not shown are the following extras (not illustrated).
1. Pendant Throttle Control 2. Chain Buckets

Purchased New in 1952 and 1953; Many in New Condition, Never Used. Those having been in operation a few months can hardly be distinguished from new.

500 LBS. CAPACITY ROLLER CHAIN LIFT

Maximum lift 10′ (Can be increased by lengthening of chain); Raised at 20 ft. per minute at 80# pressure, complete with top hook and ready for immediate operation.

TAKE ADVANTAGE OF THIS SPECIAL PURCHASE NOW ▶ **CALL LI-1-6545**

AAA MACHINERY & EQUIPMENT CO.
15539 SARANAC ROAD CLEVELAND 10, OHIO

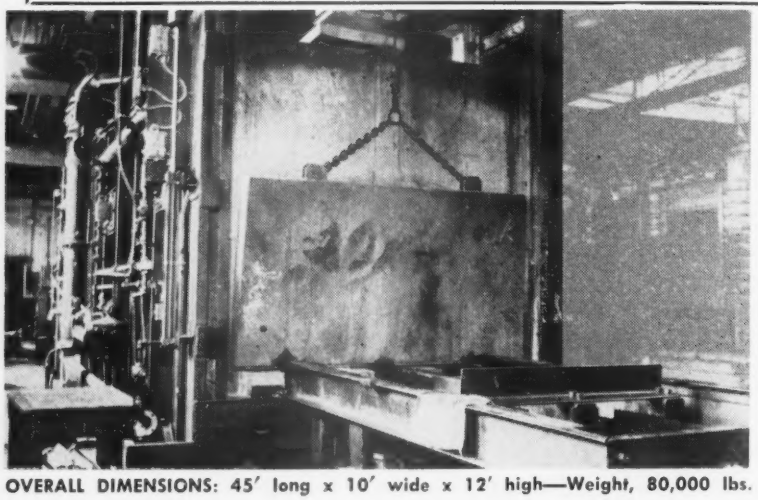
Write today for our NEW Illustrated catalog listing the largest stock of used foundry equipment ever offered.

MUST BE SOLD IMMEDIATELY

For a Small Fraction of Replacement Value

LOFTUS ANNEALING FURNACE

LOFTUS ENGINEERING CORP. ANNEALING FURNACE, Walking Beam, Pusher Type, Gas Fired, Recirculating. This unit is equipped to handle 17 baskets size 2′ wide x 2′ deep x 4′ long—Electronically cycled and controlled temp. to 1600°.



OVERALL DIMENSIONS: 45′ long x 10′ wide x 12′ high—Weight, 80,000 lbs.

Complete with the following equipment:

2 Brown recording potentiometers Type K (MA) couple 0 to 1600 degrees, mounted on floor panel.

2 Automatic dampers, 115V, 1 speed, AC, Type 401, Coolant system, city water circulating.

MOTORS ARE: 1 Lincoln 10 HP, 220/440-3-60, AC
1 Louis Allis 5 HP, 220/440-3-60 AC
1 G.E. ¼ HP, 220/440-3-60, AC
2 Louis Allis 1 HP, 220/440-3-60, AC

8. Johnson gas appl. pilot burners cat. No. 5-A, 4 A-B station with disconnects.

8 Eclipse burner blocks cat. No. 103-COZB.

8 Limit control switches—1 cycle panel control (time).

1 Brown indicating Pyro-O-Vane millivoltmeter 2 position temperature controls operating an ATC motor operated valve in fuel line.

WRITE—WIRE or CALL COLLECT ▶

AAA MACHINERY & EQUIPMENT CO.
15539 SARANAC RD. CLEVELAND 10, OHIO **LI 1-6545**

EUCLID FOUNDRY MACHINE & EQUIPMENT CO.
15139 SARANAC RD. CLEVELAND 10, OHIO **GL 1-1222**

LET US SOLVE YOUR PROBLEMS WITH OUR RECONDITIONED GUARANTEED EQUIPMENT

AIR COMPRESSORS
1—**INGERSOLL-RAND** ESI, Size 11" x 12", 300 CFM 50 HP. New 1948.
1—**INGERSOLL-RAND** ERI, Size 12" x 14", 300 CFM 50 HP.

AIR & ELECTRIC HOISTS
12—**INGERSOLL-RAND** RC-7 Air Bloc Type, 700 lb. cap., w/roller chain.
83 **INGERSOLL-RAND** RC-5 Air Bloc Type Air Hoists, 500 lb. cap.
25—**INGERSOLL-RAND** Air Hoists, Sizes A, B, D, D-6 and E, 500 to 10,000 lb.
1—**ELECTRO-LIFT** 3000 lbs cap. 4 HP
1—**SHAW-BOX** Load Lifter Jr. 1000 lbs
5—**CHICAGO-PNEUMATIC** 2-3-5 ton cap.
8—**DETROIT**, 1 to 5 ton cap.

CORE BLOWERS
1—#4 **DEMMLER**—#2 **DEMMLER.**
2—#92 **OSBORN**—#91 **OSBORN.**
2—#193 **OSBORN**—#192 **OSBORN.**
2—CB-400 **CHAMPIONS.**
6—**MILWAUKEE**—Taccone Model A-3.
1—**REDFORD** #1 Bench Type w/cartridges.

CUT-OFF SAWS & STRAIGHTENERS
1—**TABOR** C10AF—16" Wheel, 10 HP.
1—**DEWALT** Model Me2V Foundry Type Cut-Off Saw with 10 HP motor.
2—**CLIMAX** #2, 3 Wire Straighteners
2—**TESSMER** Models "H" & "I" Sprue Cutters

CORE OVENS
1—**ROSS**, 2 Compartment, car type, overall 14' L x 14' W x 7' H. Oil fired.
1—**FOUNDRY EQUIPMENT** 4 Compartment 6' x 8' x 10' each, gas fired with controls, recirculating, like NEW.
1—**INDUCTION HEATING** Dialectric Model M-800A, 600 lbs. per hour 300 hrs. use.
1—**INDUSTRIAL** Continuous Type, trays 18" x 80" long, gas fired recirculating.
1—**DETROIT** Vertical Tower 45' high, racks 14" w x 60" long, 31". Centers.

CUPOLA BLOWERS & ACCESSORIES
1—**ROOTS-CONNERSVILLE**, size 20 x 24, Type HD w/50 HP motor, etc.
1—**FOXBORO** Air Weight Controller.
1—**HAUCK** Lighter Tank & Torch.
1—**WHITING** No. 6 Cupola.
1—**ROOTS CONNERSVILLE** Rotary Positive Blower, size 5½, with 40 HP.
1—**INGERSOLL-RAND** Centrifugal Type FS-367 with 100 HP motor.

DUST COLLECTORS & ROTO-CLONES
1—**PANGBORN** #423 CH, Bag Type Dust Collector. 3240 CFM.
1—**AMERICAN AIR FILTER** No. 14 Type W arrangement "C" with sludge ejector.
1—**AMERICAN AIR FILTER** No. 27 Type W arrangement "C," with sludge ejector.
1—**AMERICAN AIR FILTER** Type N, Size 10 with No. 14 Roto-Clone & sludge ejector. Grinding Bench type.
1—**AMERICAN AIR FILTER** Type N Size 20, 20,000 CFM, with 75 HP motor.
1—**AMERICAN AIR FILTER** Type N, Size 24, 24,000 CFM, 75 HP motor.

ELECTRIC MELTING FURNACES
5—**DETROIT** Type AA Rocking 750 to 1000 lbs, w/250 KVA Transformers.

GAS & OIL FIRED FURNACES
6—**LINDBERG-FISHER** MNP Size 1700 cap, oil fired, motor-blower etc.
18—**LINDBERG-FISHER** Type SSH, Stationary, 60 lb thru 550 lbs. cap.
1—**LINBERG-FISHER** MNP Size 1000, gas or oil w/3 HP motor & blower.
3—**LINDBERG-FISHER MNP** Size 2400 lbs gas or oil fired, motorized, complete.
1—**LINDBERG-FISHER MNP** Size 225 lbs, gas or oil, w/motor-blower etc.
2—**LINDBERG-FISHER** Type BBI, #225 & #400 crucibles, hand tilt, complete.
11—**HAUSFELD** #200 Crucible, stationary, gas fired, NEW 1952.
1—**STROMAN** Model NP, 125-175 Crucible, Mechanical Tilt, gas fired.
2—**CAMPBELL-HAUSFELD** IPNT Iron Pot Type, 2000#'s Cap. gas or oil.

G. E. INDUSTRIAL X-RAY
Model KX 10, Type 1, 115 volts, 50/60 cycles, 13 amps. Serial 425456.

GRINDERS—SWING—SNAGGING—STAND
2—**FOX** #5 High Speed Stand, wheel 24" x 3"—10 HP motor.
1—**HAMMOND WR-1** Double End Snag, wheel 24" x 3"—10 HP motor.
1—**U. S.** Electric Swing Frame, 15 HP, 2 speed, wheel 24" x 3" x 12".
6—**U. S. ELECTRIC** #65 Snag Grinder, 15 & 20 HP—4 speeds, wheel 24" x 3".
2—**U. S. ELECTRIC** #64 Snag Grinders, 7½ hp, adjustable speed, wheel 14" x 3".

LADLES & POURING DEVICES
6—**MODERN** F-9 Pouring Devices w/ladles.
6—**INDUSTRIAL** Lip Pour 24" x 24" rated 1600 lbs. enclosed Timken Gearing.
4—**MODERN** 1500 lb. Cylindrical Type, 29" x 30", w/bails, covers & stands.
3—**WHITING** 275# Cylindrical Type V-bail, 19" diam x 16" length, covered.
1—**WHITING** 10 ton lip pour, enclosed gear.

INDUCTION MELTING—HEAT TREATING
1—**LEPEL** 30 KW Spark Gap Converter w/controls & 20 lb furnace & stand.
1—**LINDBERG** Model 4860 GH, Cyclone Type gas fired, with all controls.
1—**GENERAL ELECTRIC** 1250 kva Induction M.G. set 3000 cycles, with 1850 HP
1—**GENERAL ELECTRIC** 300KW Induction MG Set, 2520 cycles—450 HP.

TRANSITE CORE PLATES
9000—Used and unused. All sizes, both plain and perforated.
Send for stock list with prices.

MOLDING MACHINES
12—**OSBORN** 275J Jolt Squeezers, portable.
6—**OSBORN** 275PJ Jolt Squeeze, stationary.
4—**MILWAUKEE** #104 Jolt Squeezer, portable.
12—**SPO** 110J Jolt Squeeze.
2—**OSBORN** 243 Jolt-Rockovers 32" x 45" table, 20" draw, 2000# jolt.
2—**OSBORN** 242W Jolt Rockovers 29" x 42" table, 1500# jolt.
1—**MILWAUKEE** 163 Jolt Squeeze Stripper 15" x 24" table.
2—**TABOR** Jolt Pin Lifts 22" x 32" table, 10" draw, 600# jolt, portable.
1—**B & P** Fully Automatic Shell Investment Unit. Pattern size 20" x 24".
2—**HERMAN** Jolt Rollover Pattern Draw, 6000 series, 42" x 78" table, 6000 lbs.
2—**HERMAN** 40" x 60" Plain Jolt.
1—**INTERNATIONAL** PKL Jolt Squeeze Strip, 18" x 24" table, 6" draw.
1—**INTERNATIONAL** LP-10 Jolt Pin Lift.
2—**INTERNATIONAL** Type G, Size 24 x 10
1—**JOHNSON & JENNINGS** #815 Jolt Rollover Pattern Draw, 30" x 40" table.
1—**JOHNSON & JENNINGS** 612RBP Jolt Rollover Pattern Draw, table size 24" x 30", 12" draw, 600# capacity.
1—**MILWAUKEE** No. 1536 Jolt Pin Lift table 32" x 38", 1500 lb. jolt, 12"
1—**MILWAUKEE** No. 125-3 Jolt Squeeze Pin Lift, table 21" x 27", 1200# jolt
1—**MILWAUKEE** #167 Jolt Squeeze Rollover Draw, 32" x 33" table, 12" draw, 16" Squeeze, 1000# Jolt.
2—**OSBORN** #710J Jolt Squeeze Pin Lift, 16" x 25" table, 6" draw, 10" squeeze.
1—**OSBORN** No. 563-9 Jolt Pin Lift 55" x 63" table, 12" draw, 7000 lbs. Jolt.
1—**OSBORN** #342-1 Jolt Rock-Over Pattern Draw, 23" x 38" table, 10" draw, 1000#.
2—**OSBORN** #405 Jolt Rollover, table 57" x 64", 26" draw, 3000 lbs jolt w/rollout.
4—**OSBORN** #210 PJ Jolt Squeezers.
4—**OSBORN** #40 & #42 Core Rollovers.
1—**OSBORN** 710PV Vibrating Jolt Squeeze Pin Lift, table 16" x 25", 6" draw.
6—**OSBORN** No. 212PJ Jolt Squeezers.
1—**SPO** #508 Jolt Rock-Over Pattern Draw, 28" x 30" table, 9" draw, 1200# jolt.
2—**TABOR** 22" x 32" Jar Rollovers.
2—**TABOR** 30" x 40" Jar Rollovers.

MATERIAL HANDLING EQUIPMENT
1—**FARQUHAR** 18" x 35' portable Trough.
500'—**MATHEWS** Gravity Roller Conveyor, 10"—16"—18" width FOUNDRY TYPE.
1—**LINK-BELT** Overhead Conveyor, 100' track, chain, trolleys, curved, motorized.
1—**ELECTRIC BRIDGE** Crane, 25' span, with 2 ton R & M Hoist, 150' track.
1—**JEFFREY** Trough Belt Conveyor, 75' centers, belt 24", with motor drive.
1—**JEFFREY** Trough Belt Conveyor, 103' centers, 24" wide, motor & drive.
3—**LOUDEN MONORAIL SYSTEMS**, "Super Track" (1) 110' of 6" I-beam & two 20' bridges (2) 140' of 6" I-beam & two 12' bridges (3) 130' of 11" I-beam & two 30' bridges; all complete.
1—**SIMPLICITY** Model OA-10-JA—24" x 16' long Vibrating Conveyor.

SAND MULLERS
1—**CLEARFIELD** #404 w. Skip Hoist.
1—**CLEARFIELD** #610.
1—**SIMPSON** #1 Style B, Single Muller.
1—**SIMPSON** #3 Style C, Separate Drive, Enclosed Gears.
1—**BEARDSLEY & PIPER** #80, 24 cubic feet batch 125 HP, w/cooling, 1953.
1—**BEARDSLEY & PIPER** #50, Speed Muller w/skip hoist, dust hood, 50 HP.
1—**BEARDSLEY & PIPER** #70.
1—**CLEARFIELD** #930, batch 30 to 40 cu. ft 9' pan, w/60 HP motor etc.
1—**SIMPSON** #1½ style UD—Skip Loader.
1—**SIMPSON** #2 style UD—skip loader.

SAND PREPARATORS
1—**PEKAY** Aerator Model 320-3, capacity 120 tons per hour.
1—**B & P** #70 Portable Preparator w/grating screen, aerator, magnetic separator, 90 cu. ft. hopper.
6—**BEARDSLEY & PIPER** Models S, M and L Screenerators.
8—**ROYER** Sand Conditioners, all models, NC-2, NDP, C-2, etc., portable.

SAND CUTTERS—By "AMERICAN"
1—Model AM—Size 69/45.
1—Model BD—Size 75/60.
1—Model M—Size 99/80.
1—Model M—Size 89/70.

SAND SLINGERS
1—**B & P** 19" Tractor Type, 13' arm.
1—**B & P** 16" Tractor Type, 13' arm, magnetic tower, 4' ramming 4" tip.

SHAKEOUTS & SCREENS
4—**SIMPLICITY** 4' x 8' Model D. 16,000#.
1—**ROYER** Combination Shakeout & Sand Conditioning unit, serial #ST-47.
4—**SIMPLICITY** 4' x 6' Model B, 5000#.
1—**SIMPLICITY** 4' x 10' Model D with Automatic Crusher, 15,000# load.
3—**SIMPLICITY** 3' x 6'—Model BG, 5000#.
1—**SIMPLICITY** 6' x 8' Model DE, Dual unit—4 bearings, split deck, 20 HP.

SCALES
1—**FAIRBANKS MORSE** Open Dial, 4' x 5' platform, 6000 lb. capacity.
1—**TOLEDO** Floor Type Platform, open dial, 200# capacity.

TUMBLING BARRELS
2—**SLY** 42" x 72" Square, with 10 HP Gearhead motor—magnetic brake.
1—**ROYERSFORD** 36" x 60" w/motor.
1—**SLY** 36" x 60" Type C, 5HP Gearhead Motor—magnetic brake.
4—**WHITING** 48" x 72", 10 HP Gearhead Motor—magnetic brake.

WHEELABRATORS & TABLAST
1—**AMERICAN** 42" x 48" Tumblast, with skip hoist.
1—**AMERICAN** 27" x 36" Tumblast with skip hoist loader.
1—**PANGBORN** 6 LG-14 Rotoblast table 6', with (6) 24" tables, new 1952.
1—**PANGBORN** 6 LF Rotoblast Table, 6' Diam. w/dust collector.

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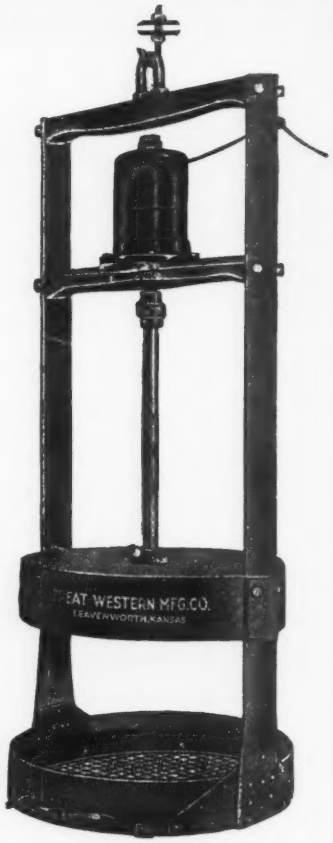
Screens sand Fine, Coarse, Medium. 20″ dia. sieve with special clamp for 5-second changes. Does work of 10 men. Fully-enclosed 1/6 h.p. motor. 4′6″ high, weight 100 lbs. 20″ Sieve: $275.00. Giant V-5, 36″ Sieve: $495.00.

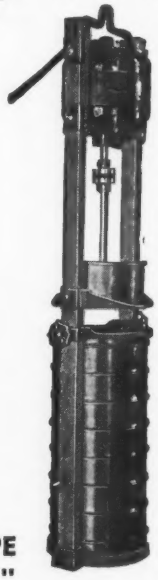


TYPE "CR"

24″ dia. round sieve. Thoroughly sifts, mixes, fluffs, aerates the sand. 1/3 H.P. enclosed motor Height 4′6″, weight 250 lbs. Complete: $350.00.

TYPE "CS"

24″ square sieve. Continuous operation, no dumping. Refuse tails off to one side. Height 4′10″, weight 295 lbs. with 1/3 h.p. enclosed motor. Complete: $360.00.



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Laboratory model . . . specially designed for sand control. Fitted with 1/6 H.P. motor. Price, complete less sieves: $250.00.

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Washington, 4 ... 1123 National Press Building Executive 3-6849
London ..... 2 Caxton St. Westminster, S.W. 1
Griffin, Ga. ..... 331 South 12th St.

Published monthly by

THE PENTON PUBLISHING COMPANY

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R. C. JAENKE ..... *Executive Vice President*
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Subscription: United States, possessions and Canada, one year $5; two years $8. Other foreign countries, one year, $10. Single copies 75 cents. Copies published three months or more previous to date of current issue, $1.00.

Member: National Business Publications, Inc.; and Society of Business Magazine Editors.

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Second class mail privileges authorized at Cleveland, Ohio.

FOUNDRY *is indexed regularly by* Engineering Index Inc. 29 West 39th St., New York 18.

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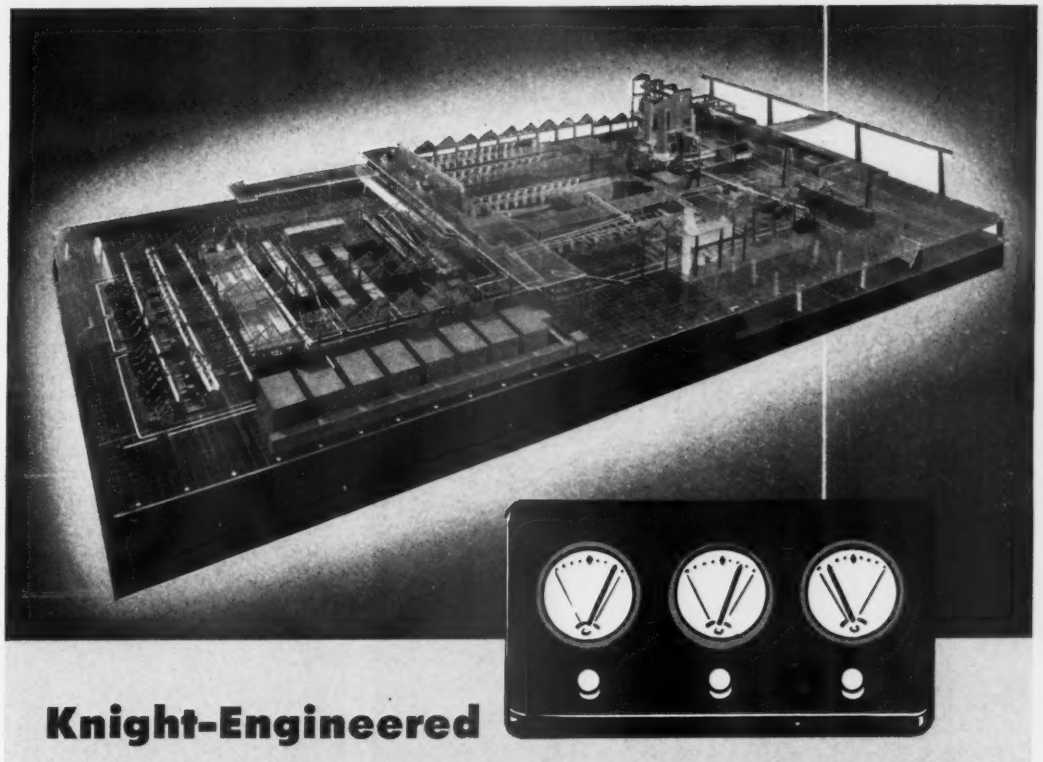

Knight-Engineered

AUTOMATION

increases labor productivity 52% in major foundry

Experienced Knight Engineers, working closely with the client's staff, completed the automation of this foundry unit 18 months ago.

The successful integration of foundry operations into a continuous production sequence, *from raw material to finished product*, increased over-all labor productivity 52%. In one operation alone, 9 men now produce what 53 men formerly produced.

Automation has also accelerated materials handling, established uniform product standards, improved worker morale, increased space productivity 33%, and brought major economies throughout the over-all operation. Necessary changes were scheduled progressively so that automation was accomplished without interrupting production.

The successful operation of this foundry is just one example of Knight's practical experience in the engineering services that increase foundry productivity and decrease unit costs.

Your operation will benefit by the comprehensive experience of Knight Engineers who have completed approximately 400 foundry assignments. A letter will bring a call from a Knight representative at your convenience.

Knight services include:

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Construction Management
•
Organization
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Industrial Engineering
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Mechanization
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Methods
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Materials Handling
•
Automation
•
Survey of Facilities

Write for your copy of new Bulletin 101— "Professional Foundry Engineering"

EVIDENCE OF EXPERIENCE

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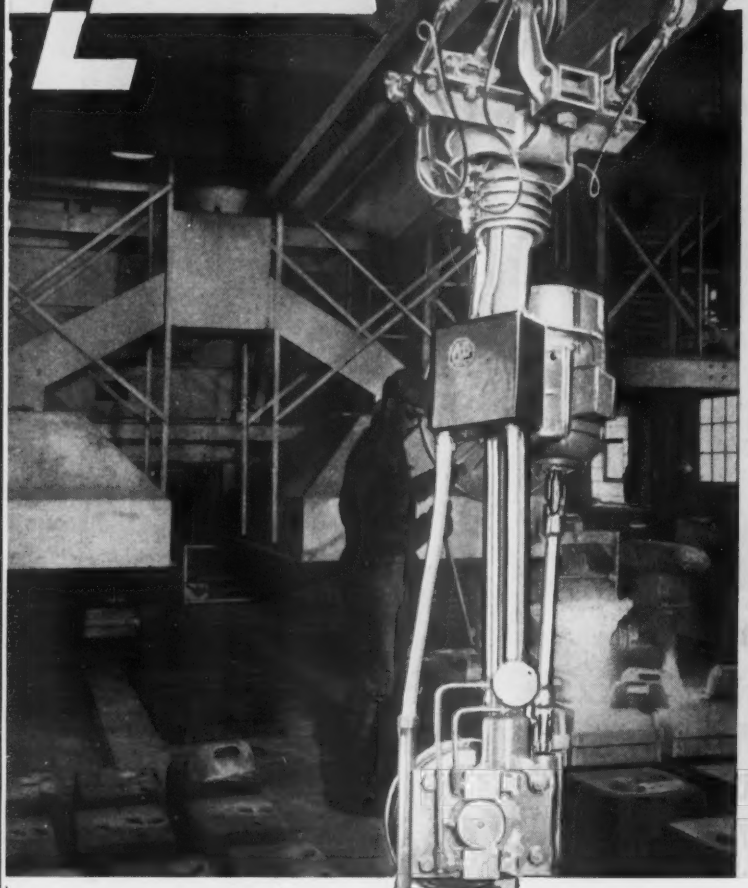
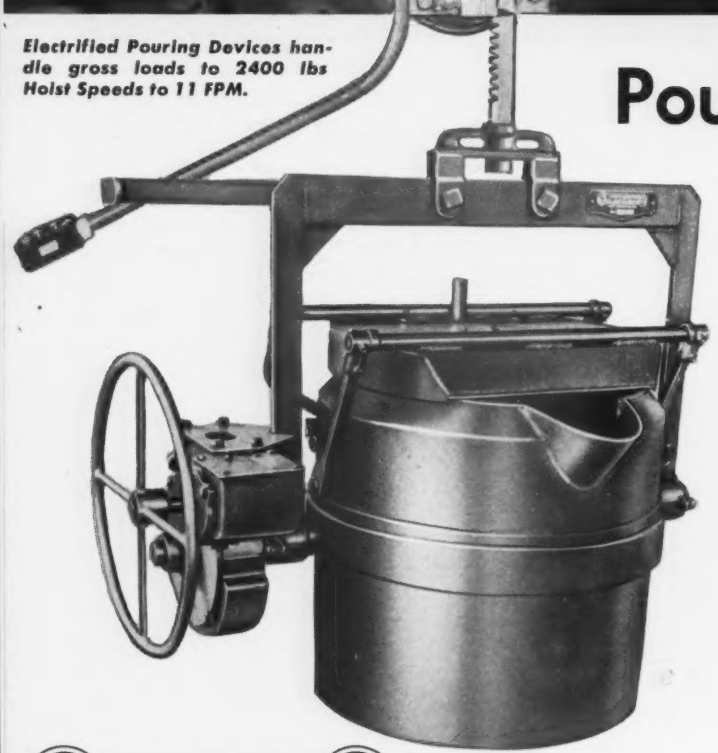
Electrified...



Monorail, cab controlled, elec carrier with ladle of 6000 l capacity.

Electrified Pouring Devices handle gross loads to 2400 lbs Hoist Speeds to 11 FPM.



Pouring and Distribution

Ever since making the first, mechanical POURING DEVICE numerous patented improvements have been added to cut pouring costs while boosting foundry tonnages. And now with ELECTRIFIED drives for lift, traverse and pouring more castings flow by push button:

- Back-breaking work is eliminated...
- End-of-heat fatigue is minimized...
- Fewer loss-time accidents reduce insurance rates...
- Less metal is pigged...
- Waste due to chilling is nil...
- Over-all quality of metal is high

All MODERN pouring and distribution systems are engineered to the need. Whether the job calls for a basic, standard design or a MODERNIZED, high-speed, cab-controlled, carrying system as illustrated you will want a copy of catalog P-152-A—the latest, MODERN catalog on ENGINEERED POURING SYSTEMS . . .

MODERN

MODERN EQUIPMENT CO., Dept. F-11, Port Washington, Wis.

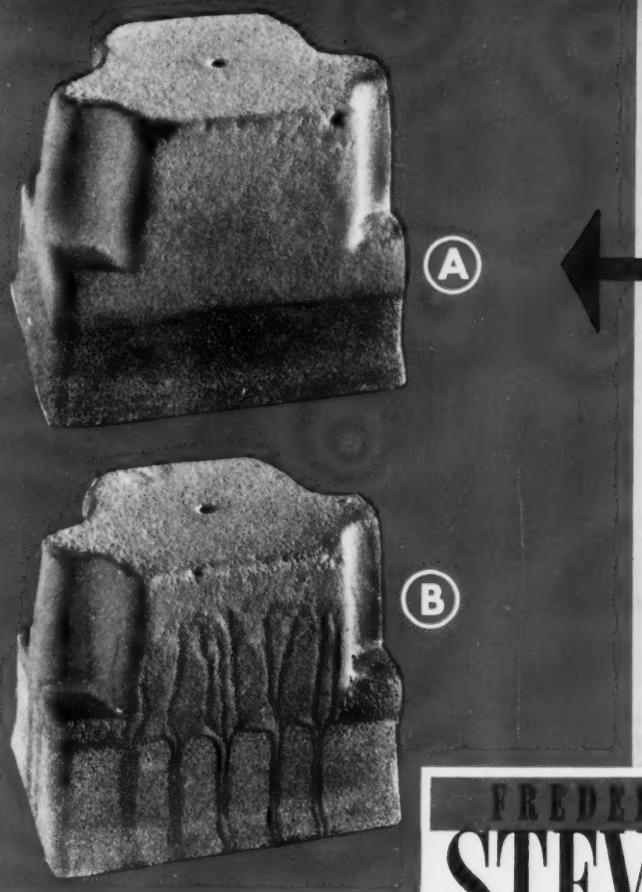
Send catalog P-152-A on ladles and pouring ☐
Catalog #150 on cranes, monorail, trolleys, switches ☐
Catalog 147-A on cupolas, chargers, hot blast, dust control ☐

Company .....
Street .....Zone .....Box .....
City .....State .....
My Name .....

THEY'RE NEW! THEY'RE DIFFERENT!

2 NEW STEVENS CORE COATINGS

FOR BETTER CASTINGS—AT LOWER COST



STEVENS GRAPH-KOTE

A GRAPHITE CORE COATING

The unretouched illustrations at the left show (A) a core that has been dipped in the new Stevens Graph-Kote Core Coating while (B) shows another core dipped in an ordinary core coating. Observe the difference between these two coatings. Stevens Graph-Kote shows no bleed, no run-down, no tear-drops, no build-up, while the other coating shows all of these defects. The new Stevens Graph-Kote produces better castings at lower cost when used on cores and molds for grey iron, non-ferrous and alloy castings. It produces a true grey iron color on castings.

STEVENS RED-SKIN

A REFRACTORY CORE COATING

Below are shown unretouched photographs of (C) a core dipped in the new Stevens Red-Skin Core Coating and (D) a similar core dipped in a standard type carbon-free core coating. Note the difference between these coatings. Stevens Red-Skin does not run, streak, tear-drop or pile up at the edge of the core. The other coating shows inferior application. The new Stevens Red-Skin reduces costs and aids in the production of better castings when used on molds and cores for steel, grey iron and non-ferrous. It is carbon-free and is highly refractory.

FREDERIC B. STEVENS INCORPORATED

EVERYTHING FOR A FOUNDRY

DETROIT 11, MICHIGAN

After months of research, formulation and testing in foundries under varied conditions, the Stevens Laboratories are proud to introduce two new and different core coatings — Stevens Graph-Kote and Stevens Red-Skin. Both have advantages to foundrymen.

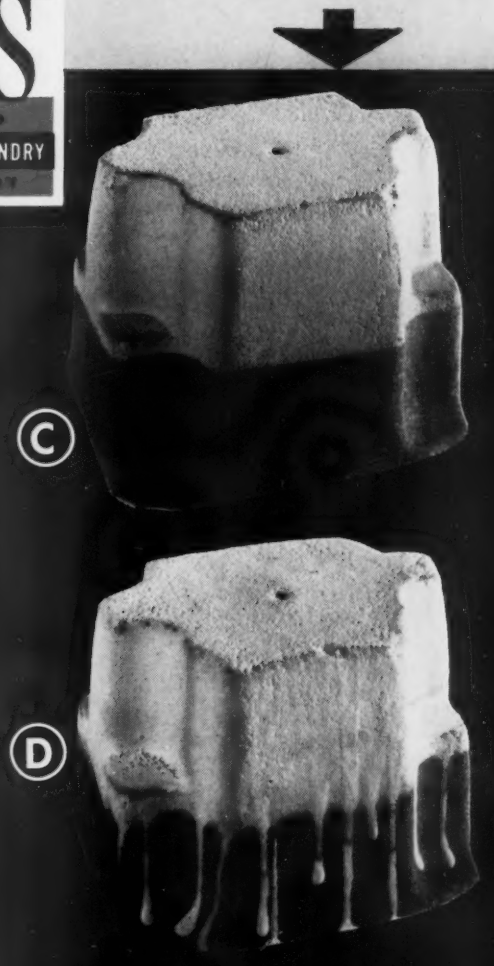
Will Reduce Labor Cost: Since both Graph-Kote and Red-Skin are "short" they coat only where a coating is needed. The dip line is sharp. No run-downs, sags, tear-drops or build-up to clean from cores. Cores can be dipped faster, core prints and assemblies fit accurately and conveyors and oven racks are kept cleaner.

Both Have Deep Penetration: For protection against metal penetration Graph-Kote and Red-Skin seal several layers of sand to insure easy peel from castings. An even, uniform coating gives ample coverage to produce clean castings.

Are Tough and Rugged: Will withstand the most severe conditions of impinging and flowing metal since the coatings are firmly anchored to mold and core surfaces and are resistant to high pouring temperatures.

Other Advantages: Stevens Graph-Kote and Red-Skin form smooth, foam-free solutions. They are ready to use, with no waiting period, as soon as they are completely mixed. Can be stored indefinitely without deteriorating in polyethylene lined containers.

To get better castings at lower cost investigate Stevens Graph-Kote and Red-Skin Core Coatings today.



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sand, mold and castings handling systems

Engineered— Built and Installed

to meet your individual requirements

● Tailor made to your kind and type of work, your production requirements and plant conditions, Bartlett-Snow foundry systems assure faster delivery — of better castings — at lower cost. Ample working areas, free access to machines and proper arrangement of equipment eliminates stock-piling and re-handling between operations, automating the smooth, efficient flow of material from sand and metal storage to the shipping dock. Our wide experience includes substantial installations in many of the country's newest, best known and lowest cost foundries. Let us work with you on your next project.

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DECEMBER
1955

FOUNDRY

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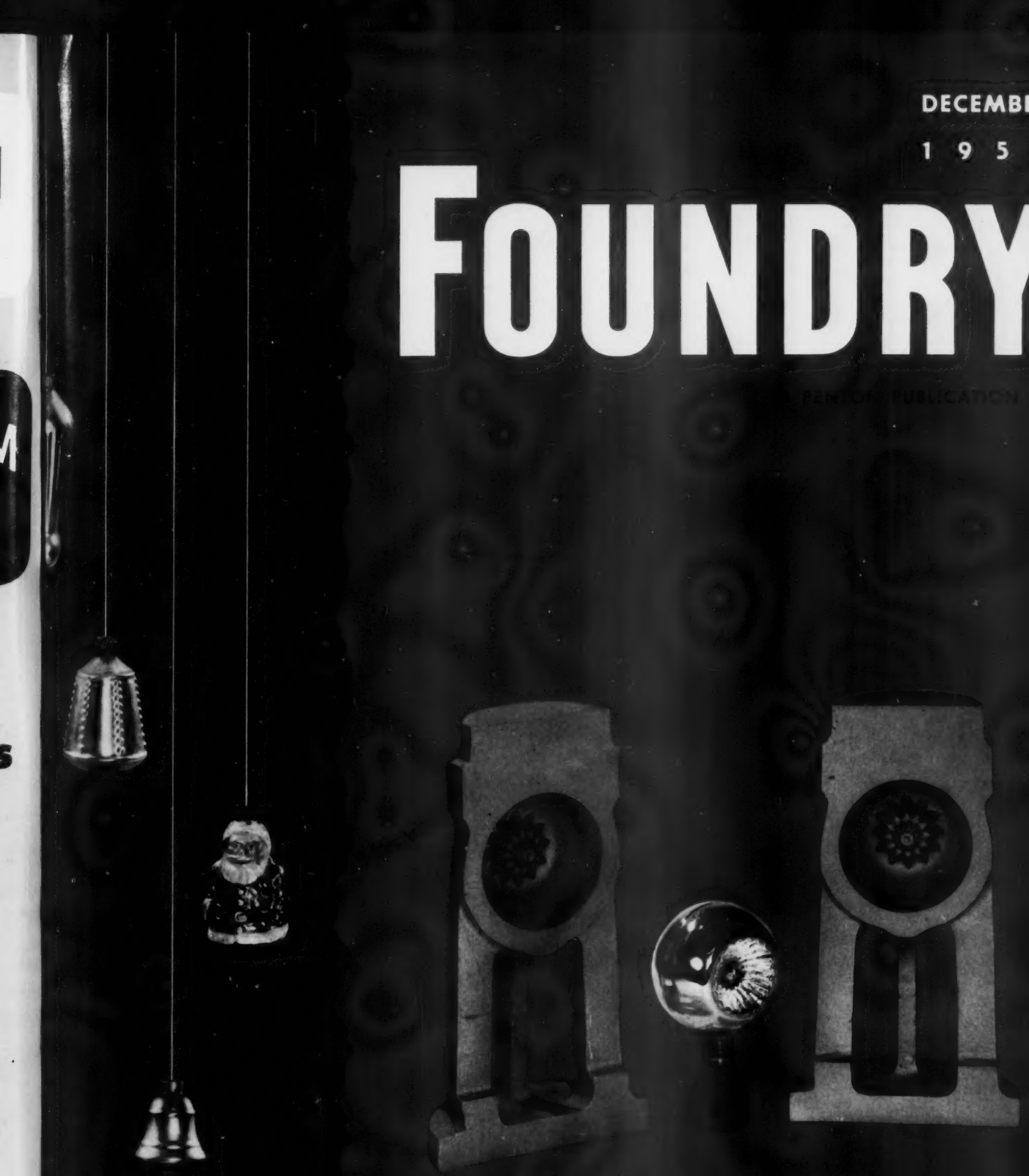

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PURITE

...for 100% fluxing action in the cupola

PURITE

...for 100% desulphurizing action in the ladle

1. Purite produces higher percentages of finished castings—fewer rejects per ton of metal poured.
2. Purite is time-tested and proved for rapid and unsurpassed desulphurizing uniformity.
3. Purite permits the use of higher-sulphur raw materials.
4. Purite is 100% pure fused soda ash—you do not pay for inert materials.
5. Purite comes in uniform 2-lb. pigs—no weighing or measuring required.
6. Purite does not crumble—is easy to handle —no waste, no dust.
7. Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.

Purite, the scientific flux for better melting and cleaner iron, is sold by leading foundry supply houses in the United States and Canada.

MATHIESON

MATHIESON CHEMICALS

OLIN MATHIESON CHEMICAL CORPORATION

INDUSTRIAL CHEMICALS DIVISION • BALTIMORE 3, MD.

TECHNOLOGY DEPT.

Trouble in the foundry

... or how Chuck Wright won a war against bugs

"Last month, Fred Hamlin, metallurgist for Ajax Engine Works, asked me to sit in at a conference.

"Several big wigs from Ajax attended," continued Chuck Wright, the INCO distributor foundry specialist. "The trouble was too many Diesel engine liners and heads from their own foundry, as well as from outside sources, were failing.

"The liner problem was the least serious, because sections were relatively uniform. By making slight adjustments of composition, several producers could meet Ajax specifications.

"But not so with cylinder heads. They had plenty of bugs.

"As you probably know, service stresses, for example, arise not only from gas pressures against a head, but also from wide temperature differences between surfaces exposed to combustion and those cooled by water jackets inside the head. Also, possibly some stresses remain after machining. Or due to faulty anneal. Invariably, stresses combine and move to the weakest point of the design. It's there that castings crack. Not necessarily where stresses originate.

"Of course, I knew that prior to 1950, Ajax specified 1.25-1.50% nickel for heads, and 1-1.25% for liners. Results? Excellent! Since 1950, however, in spite of advances in foundry technique, failures from accumulated stresses continued to trouble them.

"So when Fred stood up and asked for my opinion, I reminded the group of Ajax's past experience. Heavy up the walls, if possible but also add a little nickel for strength and uniform structure in both light and heavy sections. Also, for uniform hardness. Nickel promotes pressure tightness, too. And in cylinder heads it suppresses leakers. And insist, I warned them, on Type A – well distributed and uniformly small graphite . . . to keep mechanical and wearing properties on the favorable side.

"After that conference, Ajax *did* reinstate the nickel cast iron.

"Rejections are now down because the bugs are out. It's as simple as that.

"It's simple to reach me when *your* problem involves the metallurgy of castings. The easiest way is to drop me a line in care of INCO."

INCO TRADE MARK

Chuck Wright

The International Nickel Company, Inc.
67 Wall Street New York 5, N.Y.

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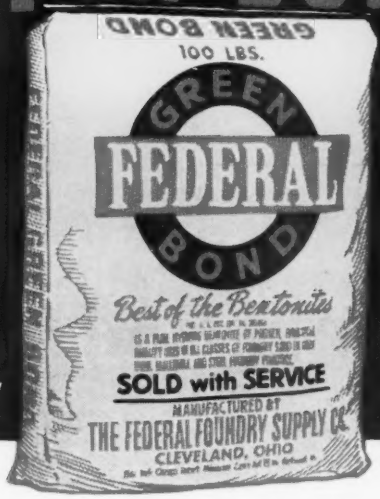
PURE BENTONITE . . . SPECIALLY



PREPARED FOR FOUNDRY USE

the standard of the world for 30 years

Bentonite was first developed in 1925, by FEDERAL, as an admix to molding and core sands. FEDERAL GREEN BOND was introduced at that time as a *pure* bentonite of the highest quality, specially processed for foundry use. It's been just that ever since—unadulterated, untreated, free of chemicals or other ingredients detrimental to foundry sands or operating conditions.

FEDERAL GREEN BOND is supplied in *three* convenient forms: (1) PULVERIZED—for general foundry use as a dry additive for core and molding sand; (2) GB-100 FINE GRANULAR—a dry additive with low dust content, for core and molding sand; (3) No. 1200 SLURRY GRADE GRANULAR—for use as a wet additive.

Next time you buy bentonite—buy the "Best of the Bentonites", the old reliable—FEDERAL GREEN BOND!

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FOUNDRY

A PENTON PUBLICATION

December 1955

Volume 83—Number 12

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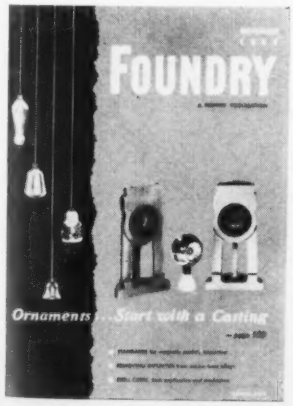

THE COVER: Castings used as molds for making decorative ornaments are shown before machining. American Brake Shoe Co., Rochester, N. Y., produces the castings. Story on page 132

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Published monthly by the Penton Publishing Co., Penton Building, Cleveland 13, O. Subscriptions in the United States, possessions and Canada, one year, $5; two years, $8. Other foreign countries, one year, $10. Single copies 75 cents. Copies published three or more months previous to date of current issue $1. Second class mail privileges authorized at Cleveland, O.

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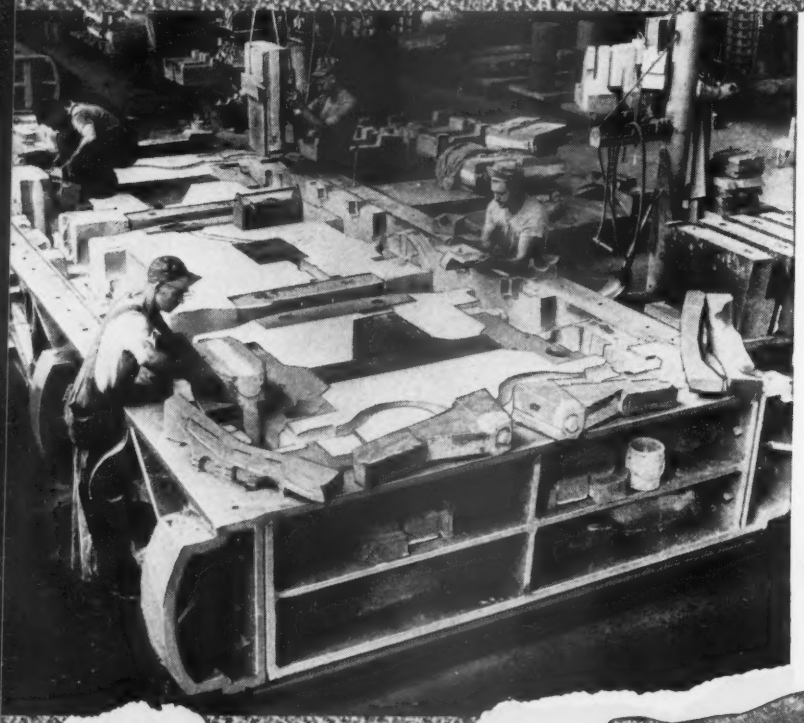
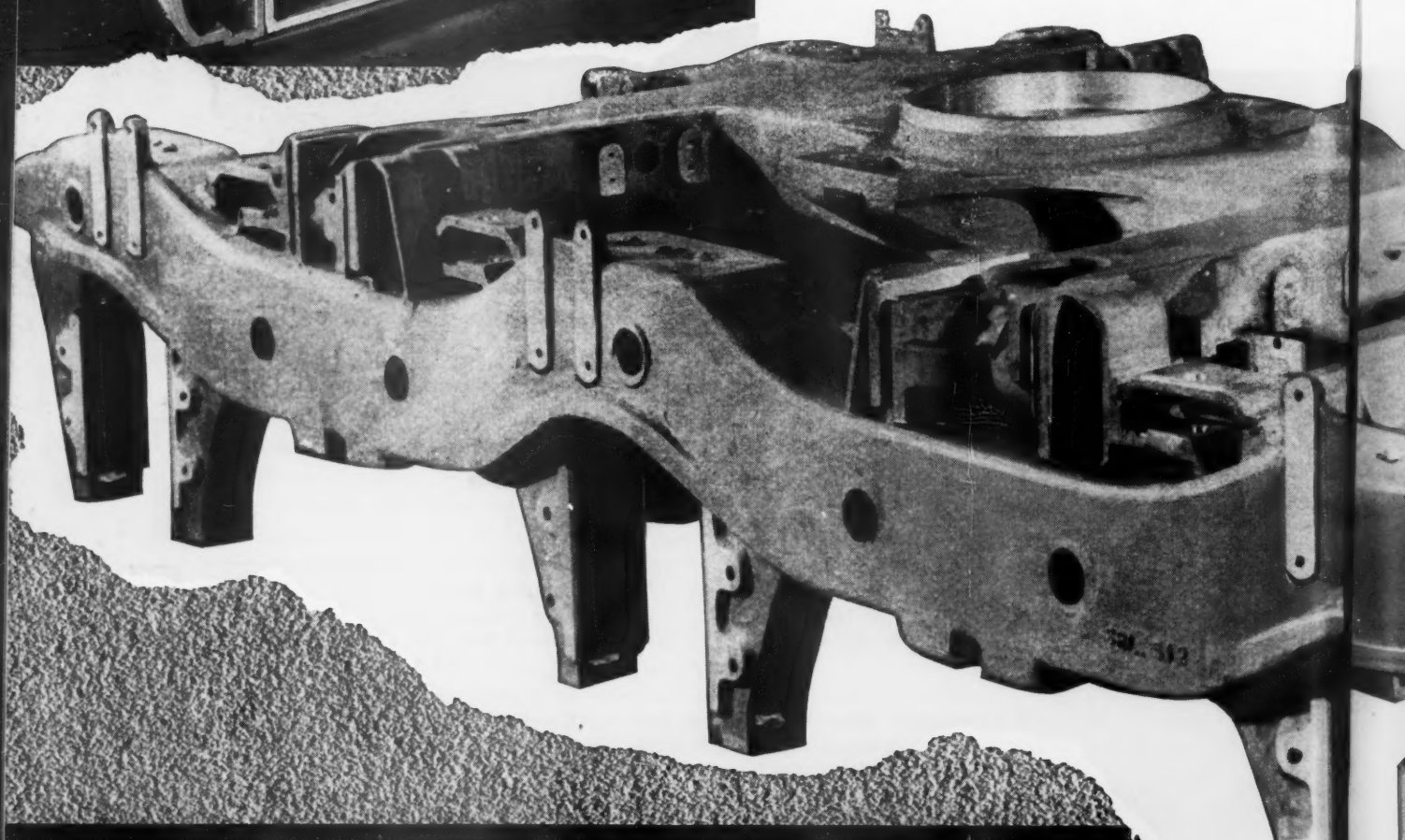
L. F. M.* FRAME TAKES 300 CORES



CASTING STATISTICS

Foundry	Locomotive Finished Material Company
Size of Casting	Approx. 22 ft. by 8 ft.
Number of cores	300
Weight of casting	9,400 lbs.
LINOIL used	8 gallons
LIN-O-CEL used	73 pounds

Setting cores for this intricate mold requires skilled workmen and the best of core ingredients. The mold, for a 6-wheel locomotive truck frame, uses 300 cores.



stay on the track with ADM foundry products

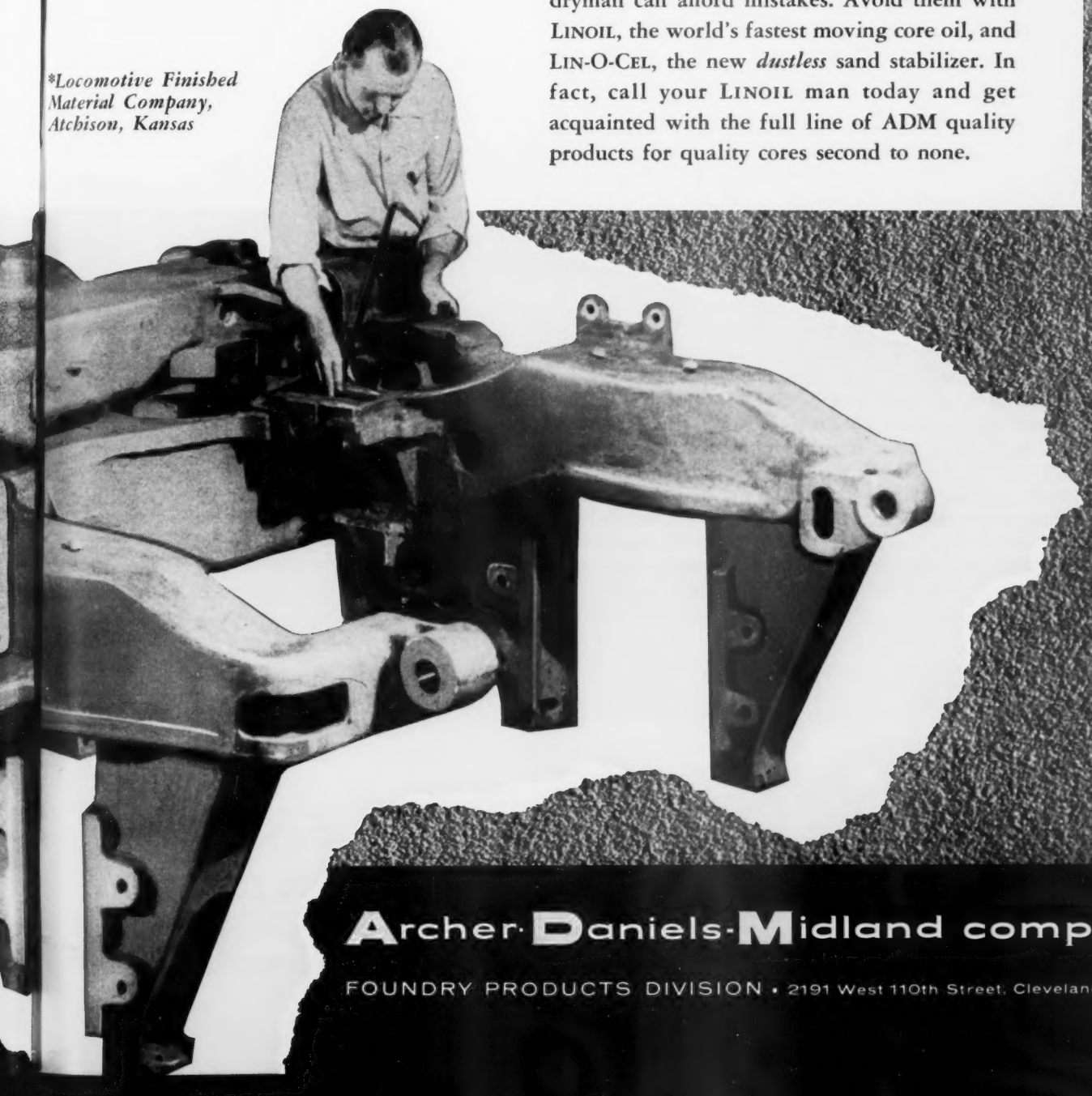
E. LINOIL CORES, OF COURSE

You can't take chances with inferior cores when pouring giant precision castings like this LFM diesel truck . . . a casting strong enough to support diesel engines . . . rigid enough to stand the stresses and strains of riding the rails . . . light enough to ease the burden of the hard-working engine . . . and costly enough to cause major concern if it has to be scrapped.

Consequently, LFM depends upon the finest in core workmanship and core ingredients of maximum quality and uniformity. LINOIL is the core oil used. It's the same from shipment to shipment; it consistently gives LFM cores the tensile strength and collapsibility required. LIN-O-CEL imparts the flowability they want and helps prevent buckles, scabs and hot tears.

In pouring intricate castings this size, no foundryman can afford mistakes. Avoid them with LINOIL, the world's fastest moving core oil, and LIN-O-CEL, the new *dustless* sand stabilizer. In fact, call your LINOIL man today and get acquainted with the full line of ADM quality products for quality cores second to none.

**Locomotive Finished Material Company, Atchison, Kansas*

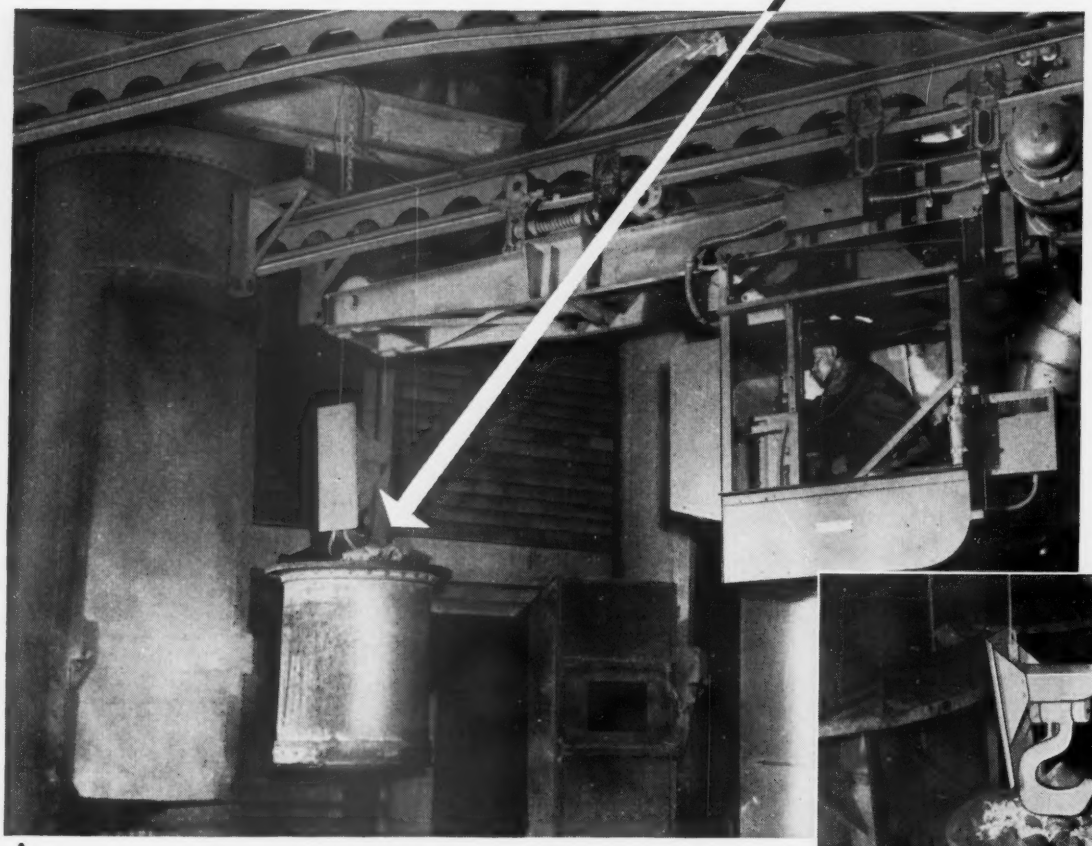


Archer-Daniels-Midland company

FOUNDRY PRODUCTS DIVISION • 2191 West 110th Street, Cleveland 2, Ohio

A Radically Different **CUPOLA CHARGER**

2400 lbs. per charge 22 trips per hour



A

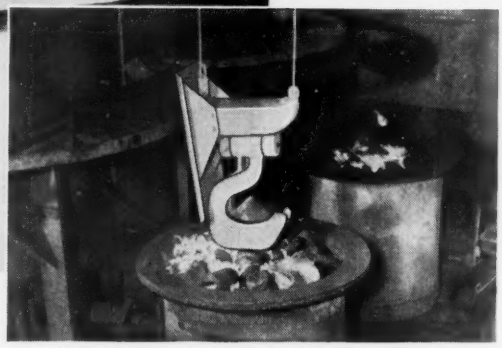
Every 3-minute period a 2400 lb. charge is delivered from the charging floor to any of 4 cupolas with this Tramrail charger.

B

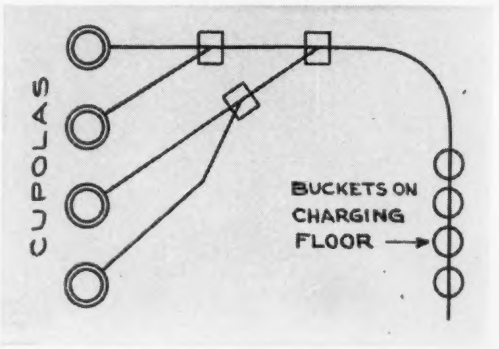
Buckets on floor far below Tramrail System can be hooked or unhooked by means of the special hook by the cab operator alone.

C

One charging carrier operating on this Tramrail track and switch system serves the 4 cupolas which are operated in pairs on alternate days.



B



Here is a tried and proven Cleveland Tramrail cupola charger that is different from others in that the cab operator alone can hook and unhook charge buckets by means of a special hook without leaving the cab and without assistance of floor men.

A bucket is hoisted from the charging floor, far below, and delivered to anyone of four cupolas. When lowered into a cupola, the materials drop out as the cone-shaped bottom separates from the bucket shell. The Tramrail operator then returns the empty bucket to the charge floor.

This highly efficient cupola charger has been in successful operation in a prominent mid-western foundry since 1940. Iron is melted continuously 20 hours per day.

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THE CLEVELAND CRANE & ENGINEERING CO.
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FRANKLY SPEAKING...

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LET'S FACE THE FACT . . . in the Gray Iron industry, you are in a highly competitive business. You are in competition with other materials and methods . . . in competition with other foundries.

LET'S FACE THE FACT . . . who wins in a competitive situation? It's usually the man, or foundry, or material that can do the best job for the customer . . . in quality, in performance, in cost.

LET'S FACE THE FACT . . . you can't stand still in a competitive situation. You've got to keep up with your own industry. You've got to keep ahead of competitive materials and methods. Static thinking or static technology soon leaves you or your company with a static or declining backlog and profit margin.

LET'S FACE THE FACT . . . throughout the Gray Iron industry there are changes occurring constantly . . . in techniques and in business procedures. In your local marketing area, you are probably aware of these factors. But can you keep up with the entire industry?

And that's where your membership in the Gray Iron Founders' Society pays off. Through the Society, there is a free interchange of information between Society member foundries. Committees work hard on special projects which benefit the entire industry. And from the Society's headquarters, you are constantly supplied with valuable information and assistance. An ever-growing library of information on practically every phase of the industry is available for your use.

LET'S FACE THE FACT . . . can you afford *not* to be a member of the Society? Mail this coupon for full information about how membership in the Society can help you.

GRAY IRON FOUNDERS' SOCIETY

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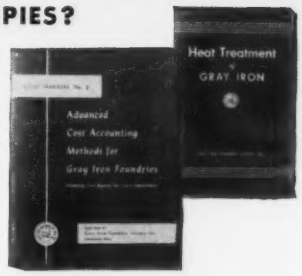
Here are the latest additions to the Society's library . . . *Cost Manual #2* and *Heat Treatment of Gray Iron* containing valuable guides and operating techniques for any progressive Gray Iron foundry.



GRAY IRON FOUNDERS' SOCIETY, INC.
National City-East 6th Building, Cleveland 14, Ohio

Please send full information on Society services and samples of helpful material.

Company _____

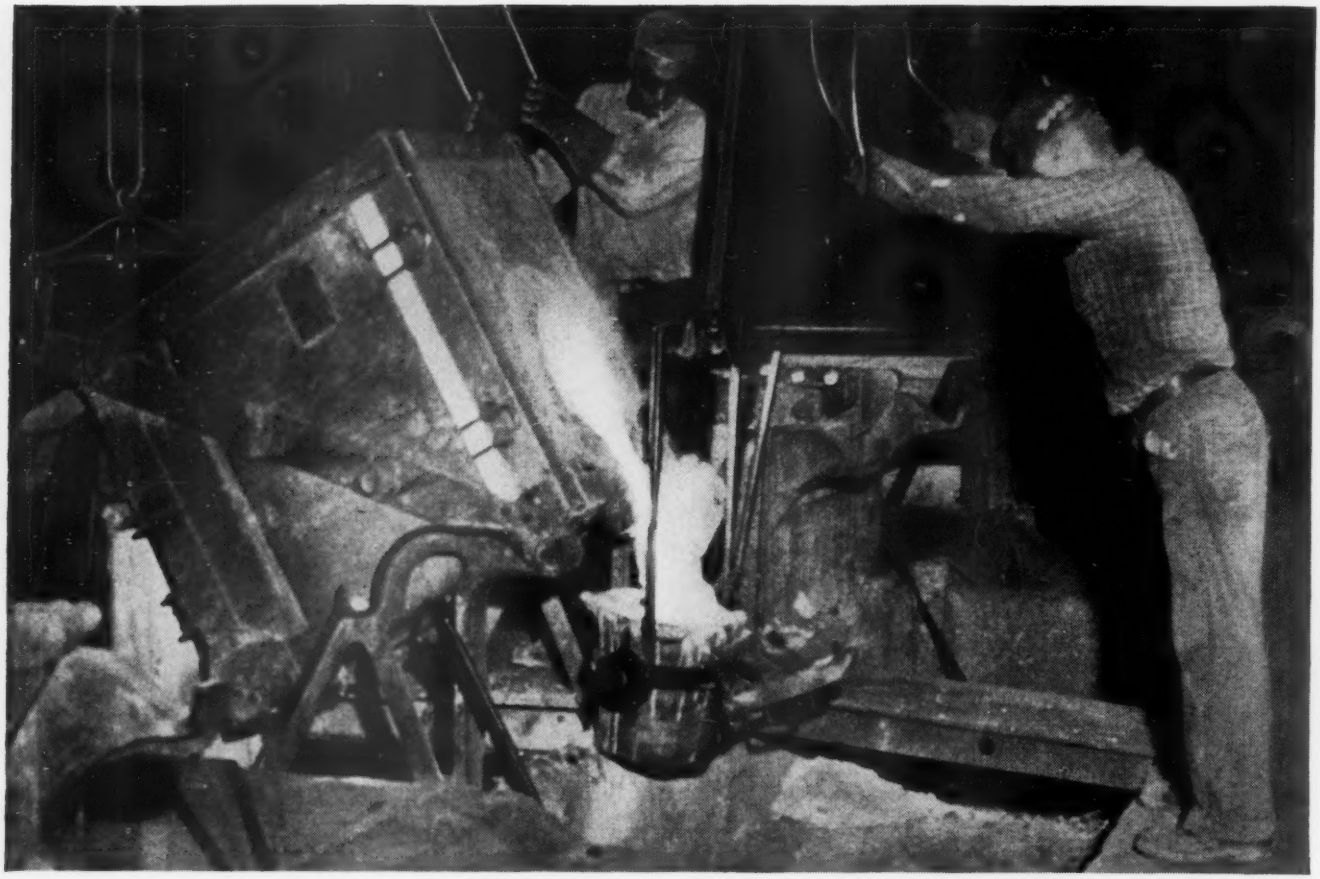
Individual _____ Title _____

Address _____

City and State _____

Another Norton

on the job!



One of the 1200-pound Ajax induction furnaces used by The Duriron Company, Inc. of Dayton, Ohio. Melts are chiefly stainless steel alloys, tapped at 3200°F or higher. MAGNORITE cement, the Norton ℞ for lining and patching these furnaces, has resulted in substantial savings — not only in the amount and cost of cement, but in time and labor.

The Duriron Company, Inc. doubles heats-per-lining, cuts melting costs, maintains stainless steel quality with MAGNORITE cement*

If re-lining is too frequent a job in your induction furnace operations — if you're using up too much time, cement and money to get maximum heats — we suggest you consider MAGNORITE cement.

Take the experience of The Duriron Company, leading manufacturers of chemical process equipment made of stainless steel and other metals. Before trying MAGNORITE cement, their best previous lining material was giving an average of 68.2 heats per lining. Thorough test runs of MAGNORITE at the Duriron foundry show this Norton refractory material is averaging 140.5 heats per lining. And it is not only lasting twice as long as its best performing competitor, it is more refractory, it has 50% less slag volume on heats, and its freedom from shrinkage eliminates cracking. Another instance of how Norton refractories and refractory materials are *engineered and prescribed* to provide time-and-money-saving ℞'s.

Give MAGNORITE cement a test run

in one of your own furnaces. Note how it withstands temperatures up to 3250°F — how its high-rammed density resists metal penetration, erosion and chemical attack — how its slight expansion when sintered eliminates shrinkage cracks in the crucible lining.

Norton will be glad to specify MAGNORITE cement to your exact requirements, or to help you solve metal-melting problems. Working with MAGNORITE*, ALUNDUM*, CRYSTOLON* and Fused Stabilized Zirconia cements, Norton engineers will find ℞'s you need for efficiency and economy. For details, see your Norton Refractories Engineer, or write to NORTON COMPANY, Refractories Division, 311 New Bond Street, Worcester 6, Mass. *Canadian Representative:* A. P. Green Fire Brick Co., Ltd., Toronto, Ontario.

NORTON

REFRACTORIES

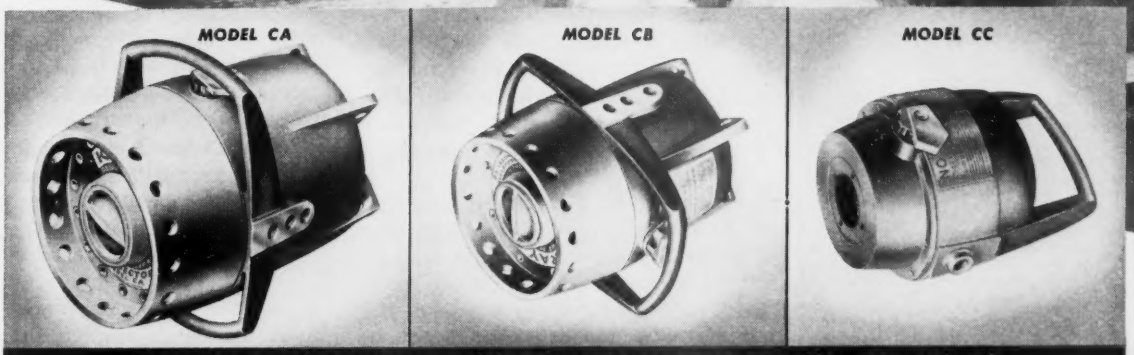
Engineered... ℞... Prescribed

Making better products... to make your products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

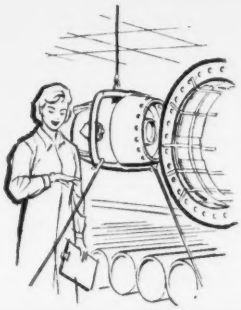
presents the KEL-RAY® Projector

A safe versatile tool for Radiography with gamma rays . . .



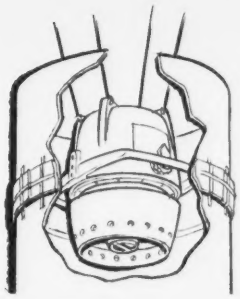
Depending on the projector model and service requirements either encapsulated Cobalt 60, Cesium 137 or Iridium 192 is used as the gamma ray source.

NON-DESTRUCTIVE INSPECTION and TESTING



SAFE

KEL-RAY projectors have extremely low radiation leakage. So low they can be shipped and stored without additional shielding. They are tamper, fire, and shock proof. Operated under prescribed procedures, leakage is below the AEC limit.

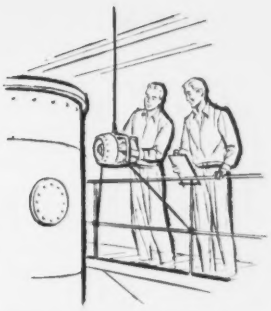


VERSATILE

A single set-up can produce either spot, doughnut, or hemisphere panoramic radiographs. Thick steel sections can be radiographed; sensitivity is so great even incandescent lamp filaments have been radiographed with a KEL-RAY projector.

CONVENIENT

Designed for field or shop use, the smallest model can be carried by hand—largest is transported and positioned speedily with standard equipment for materials handling and rigging.



ECONOMICAL

Initial and operating costs are low. No delicate parts to pamper or adjust . . . no expensive electrical power source required. Minimized overall set up and exposure time provide further savings.

Each of the three KEL-RAY Projector models is a portable, powerful, shielded, self-contained source of penetrating radiation for non-destructive inspection in maintenance, construction or quality control. There is a KEL-RAY Gamma Ray Projector that can improve your operations —save you time and money! Write for detailed literature.

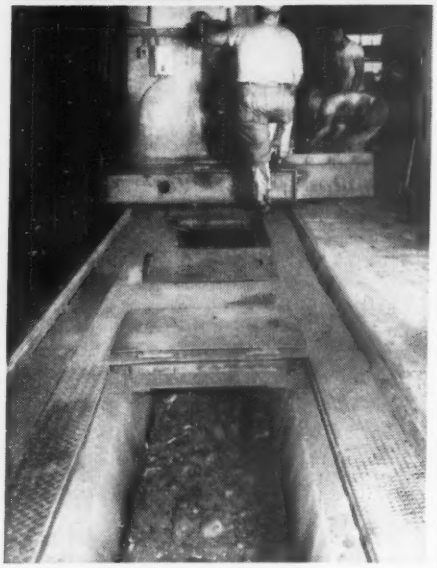
®Trade Mark of The M. W. Kellogg Company

**Sold exclusively by Metal & Thermit Corporation. Designed and manufactured by The M. W. Kellogg Company.*

METAL & THERMIT CORPORATION

100 EAST 42nd STREET • NEW YORK 17, N. Y.

This foundry DOUBLED BELT LIFE by switching to IMPERIAL



Long-wearing Imperial Belting gives maximum economy

Sand and metal with temperatures up to 500° F. drop directly on an Imperial Stitched Canvas Super Insulated Sahara Conveyor Belt used in the foundry of Empire Steel Castings.

That's rugged service . . . with the belt subject to damage by tearing, heat, impact and abrasion. Yet the Imperial Belt used (217′ x 24″ x 6 ply, with armored reinforcement) has been in operation 24 hours a day since January, 1954. This is double the life of belting used previously, the foundry operators report.

Imperial Sahara Belting is job-designed to outwear any other belting made for foundry service . . . and thus give lowest ultimate belting cost. Write for informative Data Sheet 54-2 and describe your belting needs.

Imperial BELTING CO.

1755 S. Kilbourn Ave., Chicago 23, Ill.

You expect MORE from Imperial . . . and you get MORE!

With the EDITORS

Is History Repeating? Harry Truman, in the recently published first volume of his memoirs, tells about the White House press conference on Aug. 14, 1945, at which the surrender of Japan was announced. In discussing those present, he stated, "Cordell Hull, now seriously ill, and for many years a most distinguished Secretary of State, did not arrive until the conference was nearly over, but I was glad that we could include him in the official picture that was taken of the event. He had done much to make this day possible."

Reading this, I could not help but wonder what interpretation the distinguished metallurgists and leaders of the metalworking industry, who went to Washington in the days before the war to plead with the State Department to curtail the exportation of scrap to Japan, would put on the statement, "He had done much to make this day possible."

And I wonder what will be the judgment of history for those in the State and Commerce Departments who are sanctioning the exportation of approximately 4,250,000 tons of scrap in 1955.

Should a national emergency develop in the near or distant future, the present licensing of scrap exports may prove little short of criminal.

—o—

Knowledge Goes Way Back: Sometimes when we get to thinking how good we are and how much progress we have made, something comes along to take the wind out of our sails. For example, examination of seven metal fragments, at least 12 centuries old, which were found in a cave in Afghanistan, has led Dr. Earle R. Caley and Wallace H. Deebel, Ohio State University chemists, to conclude that the metallurgists of that day were good. They point out that such a variety of alloys and skills as found in these fragments indicates an advanced stage in the art of metallurgy that could have been reached only on the basis of a long background of experience and practice.

"One of the oldest fragments, a broken piece of pin or shaft dating from the seventh or eighth century A.D., was made of a tempered steel. A pin or shaft of wrought iron or mild steel, and a broken arrowhead of wrought iron or steel were of comparable age. Other objects examined were a lead-tin bronze coin bearing a crude design and dated in the 9th or 10th century A.D.; a bronze fragment of high-lead content, ninth or tenth century A.D.; a piece of pin or clasp of about the tenth century A.D., which had been cast from a tin-lead alloy, an ancient kind of pewter; and a flat piece of white cast iron dated between the tenth and 13th centuries A.D., which the analysts reported was 'superior to modern white cast iron' in terms of quality.

"The chemists said that iron of such high purity could have been produced by smelting a carefully selected, pure iron ore with charcoal in a blast furnace maintained at a relatively low temperature by the application of a regulated flow of unheated air. Higher percentages of impurities in modern cast iron, they explained, arise from use of unselected ore, coke as a fuel and from the higher temperature resulting from use of a blast of preheated air."

—o—

Automation: The following interesting comment on the small foundry and automation was made recently by E. J. Benge, Benge Associates, Asheville, N. C.: "It's not the size of the business, but the volume and nature of products which determine where automation is cost-wise. Big corporations so far have been avid for possible applications. The small plant executive who closes his mind to automation may soon close his doors."

—o—

Much in Common: A recent issue of *Tracks,* the excellent publication of the Chesapeake & Ohio Railway, carried an interesting article entitled "Pattern Shop to Pulpit." Rev. Arthur E. Birkett, pastor of the First Methodist Church, Huntington, W. Va., served his patternmaking apprenticeship at the Huntington C & O Shops under the late Harry Chambers, who influenced the desire to enter the ministry. Reverend Birkett insists that the pulpit and patternshop have much in common.

—o—

The Almanac: The 1956 edition of *The Old Farmer's Almanac,* established in 1792 and published by Yankee Inc., Dublin, N. H., recently crossed my desk. As the editors point out, the issue contains, besides the large number of astronomical calculations and the farmer's calendar

Harbison-Walker Refractories

serve the specialized requirements of malleable foundries

for air furnaces...

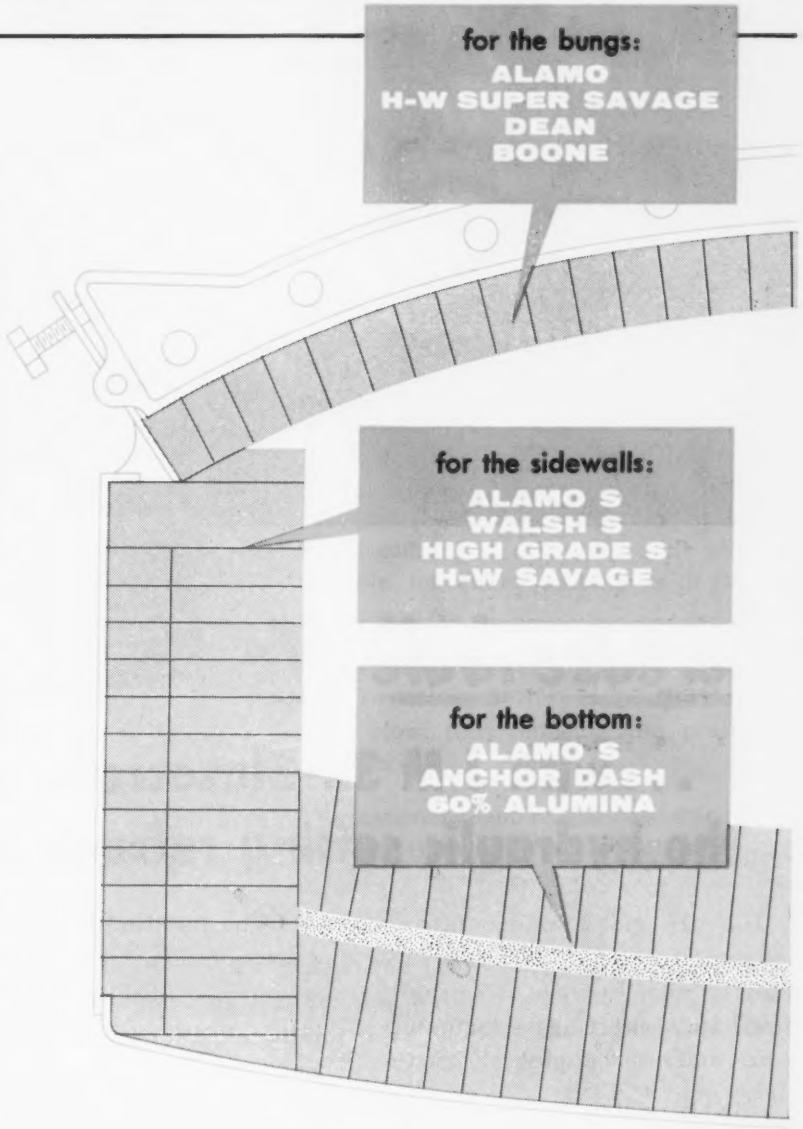
The careful selection of refractories will assist in achieving most desirable furnace performance. Some of the Harbison-Walker refractories that have proved to be most effective in bungs, walls and bottoms are indicated in the drawing at the right. In addition to these, H-W MULLITE, CORALITE, and other H-W high-alumina refractories along with corresponding mortars are used in the most vulnerable positions and contribute to uniform, balanced service life. The optimum choice of brands depends largely on the individual furnace operating conditions and plant locations for the lowest transportation costs.

for annealing furnaces...

The most suitable combination of refractories and insulation will result in improved furnace economy. Complementary to various brands of fireclay brick, Harbison-Walker provides six classes of insulating fire brick, each of which is especially suited for a specific temperature range and for the particular operating conditions involved. The over-all temperature range for these H-W Insulating Fire Brick is 1600°F. to over 3000°F.

for cupolas and ladles...

A noteworthy development in cupola linings is the Harbison-Walker Universal Cupola Block—a single shape for all diameters. For monolithic melting zone linings and for patching H-W KUPLOMIX is exceedingly effective. H-W EXTRA STRENGTH CASTABLE is used in the charging zone lining, for maximum strength and wear resistance. H-W BLACK PATCH is a plastic refractory of super-duty quality containing graphite, which is especially suited for use in cupola breast walls and for spouts, runners and ladle linings.



WHEREVER METAL IS CAST

Harbison-Walker provides quality controlled refractories for all types of foundry furnaces. Whatever the metal—gray iron, steel, malleable iron or any of the non-ferrous metals—the proper selection and application of Harbison-Walker products will result in longest refractory service life and maximum economy.

HARBISON-WALKER REFRACTORIES COMPANY

AND SUBSIDIARIES

World's Largest Producer of Refractories

General Offices: Pittsburgh 22, Pennsylvania

Increase ladle life

. . . with J-M 3X Blazecrete® the hydraulic setting refractory

You can make longer lasting linings for ladles with J-M 3X Blazecrete, because it is spall-resistant, withstands slagging action and has negligible shrinkage.

3X Blazecrete . . . the 3000F refractory . . . is easily and quickly applied . . . mix with water like ordinary concrete, and slap-trowel to desired thickness. Hardens without application of heat. Contains no harmful irritants . . . safe even for hand application. 3X Blazecrete is furnished as a dry mix, and may be stored indefinitely without deterioration.

You'll also find 3X Blazecrete ideally suited for forming run-out spouts and for gunning parts of iron cupolas.

Send for free brochure on Blazecrete (RC-28A) describing its properties and uses. To obtain your copy—as well as additional application details—write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 565 Lakeshore Road, Port Credit East, Ontario.

Whether you gun it... *or slap-trowel it...*

JOHNS-MANVILLE JM PRODUCTS **Johns-Manville BLAZECRETE**

BUILDS BETTER REFRACTORY LININGS

for every month in the year, "a variety of new, useful and entertaining matter." And it does present just that.

I always like to see what kind of weather might be expected for the annual AFS convention and the exhibition. From May 1 to 6, we find "Winter in exile makes everyone smile," and from the 7th through 10th, "Showers for the flowers." By the way, the weather prophet, Abe Weatherwise, also indicates that this winter's weather will be "as severe as any of the 20th century."

—o—

Lose a Matchplate? About a year ago, someone delivered a matchplate by mistake to the pattern shop of J. I. Case Co., Racine, Wis. The plate is aluminum and fits an 18 x 27 in. flask. It is for an intake manifold and carries No. 362437 RI.

If the plate belongs to you, or if you have any ideas regarding the owner, I suggest you get in touch with F. A. Wirt, advertising manager of the Case organization.

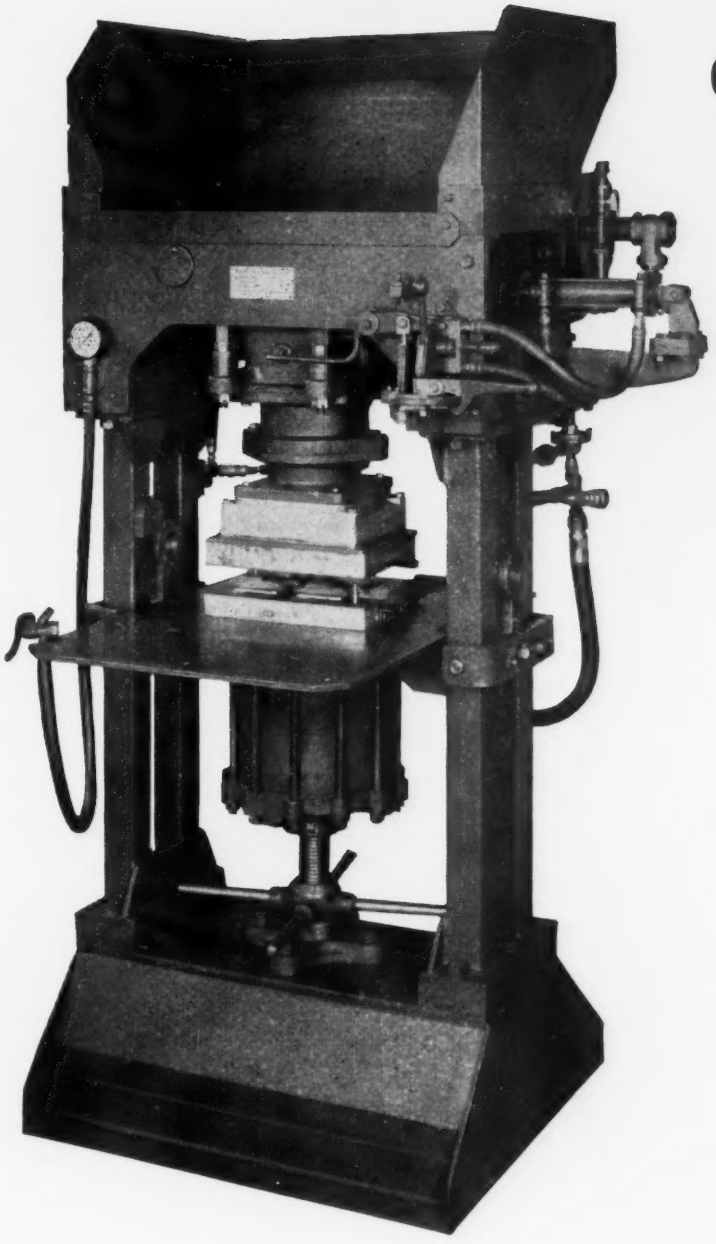
—o—

Franklin's Birthday: The 250th anniversary of the birth of Benjamin Franklin will be celebrated internationally in 1956. Because his interests were so broad and his contributions to mankind so diversified, the program marking the anniversary of his birth will cover many fields. During the year you will be hearing much about Mr. Franklin and reading many of his "quotable quotes." Looking through some of the excellent material prepared for distribution by the Franklin Institute, Philadelphia, I noted a Franklin statement on "Science" which I want to pass along:

"The rapid progress *true* science now makes, occasions my regretting sometimes that I was born so soon. It is impossible to imagine the height to which may be carried, in a thousand years, the power of man over matter. We may perhaps learn to deprive large masses of their gravity, and give them absolute levity, for the sake of easy transport. Agriculture may diminish its labor and double its produce; all diseases may by sure means be prevented or cured, not excepting even that of old age, and our lives lengthened at pleasure even beyond the antediluvian standard. O that moral science were in a fair way of improvement, that men would cease to be wolves to one another, and the human beings would at length learn what they now improperly call humanity."

Franklin's predictions, written in 1780, surely have come true, but progress in moral science still is lacking. F.G.S.

Redford No. 4-D DRAW TYPE CORE BLOWER



Designed primarily to fill the need for a fast and flexible draw type machine to handle work from a few ounces to 10 lbs., the Redford #4-D can be quickly adjusted to accommodate core boxes not requiring the draw feature, or can be equipped with a clamp to handle vertically parted core boxes.

Rugged construction, simplicity of change-overs and a fast operating cycle make it suitable for either jobbing or high production work.

Exhaust air is utilized to thoroughly fluff the sand remaining in the sand magazine after each blow, thus reducing the possibility of cratering.

The stationary sand magazine and accurately guided draw table assure perfect drawing of the cores. Vibration of the core box is automatic.

Magazine heads normally furnished with the #2 Redford machine can be used with the #4-D Redford. Larger new type magazine heads especially suited for draw type work are also available as standard equipment.

Valves are designed to assure maximum safety. The operator must use both hands at the same time in order to clamp the core box.

The Redford #4-D has been thoroughly proven in both small and large foundries. To get complete information write for Bulletin 4-D.

Redford IRON & EQUIPMENT CO.

20733 GLENDALE AVENUE • Phone KEnwood 1-8611 • DETROIT 23, MICHIGAN

OUR ERIE STRAYER BUCKETS WORK LONG HOURS, NEED LITTLE SERVICE

Reports Max Dozoretz, Partner, Lancaster Iron and Metal Co.

Clamshell buckets are put to many tough jobs. Probably the toughest is handling scrap metal. The constant brush of steel against steel lays up the ordinary bucket for frequent repairs and soon wears it out.

But not an Erie Strayer bucket! Mr. Dozoretz knows Erie Buckets. He has two of them on the job constantly. He says, "We work our Erie buckets hard—eight to ten hours a day, six days a week. We know they'll deliver full payloads with every pass.

"And we lose no time for maintenance! Our first Erie bucket has been in service, continuously, for six years now and is still going strong."

Compare the Erie with any other clamshell. You'll quickly note its finer engineering and the rugged construction that has made it the bucket preferred by experienced operators everywhere.

These Erie Features Mean More Days of More Work

1. **Top closing power from block and tackle, plus lever arm construction, plus precision balancing.**
2. **Manganese steel teeth and high carbon steel lips that bite up full payloads of even toughest clay and gumbo.**
3. **Rigid, one-piece, welded head that shrugs off bumps and jars. No shimmy. No wobble.**
4. **Two-line, continuous reeving. Adds up to 50% to cable life. Less down-time for reeving.**
5. **Low head room for fast work in tight quarters; low center of gravity for easy positioning.**

ERIE
BUCKETS THE WORLD OVER

For catalogs, write Dept. F125 Cable Address: EXIMPORT

ERIE STRAYER CO.

8125 GEIST ROAD • ERIE, PENNSYLVANIA

CALENDAR of Meetings

Dec. 1-2—Michigan Regional Foundry Conference, Michigan State University, East Lansing, Mich.

Dec. 7-9—American Institute of Mining & Metallurgical Engineers, electric furnace steel conference, Hotel William Penn, Pittsburgh.

Dec. 10-16—Nuclear Engineering and Science Congress and International Atomic Exposition, Public Hall, Cleveland.

Dec. 12-13—Material Handling Institute, annual meeting, Statler Hotel, New York.

1956

Jan. 20—Malleable Founders' Society, general meeting, Hotel Cleveland, Cleveland.

Jan. 23-26—Plant Maintenance & Engineering Show, Convention Hall, Philadelphia. Plant maintenance and engineering conference will be held concurrently with the show.

Jan. 24-27—American Management Association, general management conference, Hotel Fairmont, San Francisco.

Feb. 1-2—Midwest Welding Conference, cosponsored by Armour Research Foundation and Chicago section, American Welding Society, Illinois Institute of Technology, Chicago.

Feb. 6-9—Ventilation Conference, Michigan Department of Health and Michigan State University, Kellogg Center, Michigan State University, East Lansing, Mich.

Feb. 9-10—Wisconsin Regional Foundry Conference, Hotel Schroeder, Milwaukee.

Feb. 16-17—Southeastern Regional Foundry Conference, sponsored by Birmingham and Tennessee Chapters, AFS, Tutwiler Hotel, Birmingham.

Feb. 27-Mar. 2—American Society for Testing Materials, spring meeting, Hotel Statler, Buffalo, N. Y.

Mar. 7-8—Foundry Educational Foundation, college-industry conference, Hotel Cleveland, Cleveland.

Mar. 19-20—Steel Founders' Society, annual meeting, Drake Hotel, Chicago.

Apr. 3—Material Handling Institute, spring meeting, Edgewater Beach Hotel, Chicago.

Apr. 12-13—Malleable Founders' Society, annual market development conference, Edgewater Beach Hotel, Chicago.

May 3—Non-Ferrous Founders' Society, annual business meeting, dinner and reception, Marlborough-Blenheim Hotel, Atlantic City, N. J.

May 3-9—American Foundrymen's Society, annual convention and exhibition, Convention Hall, Atlantic City, N. J.

May 8-11—American Welding Society, spring meeting and 4th welding and allied industry exposition, Buffalo.

June 5-8—Material Handling Intitute, exposition, Cleveland Public Auditorium, Cleveland.

June 11-12—Malleable Founders' Society, general meeting, The Homestead, Hot Springs, Va.

June 17-22—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Sept. 17-21—Instrument Society of America, instrument-automation conference and exhibit, Coliseum Bldg., New York.

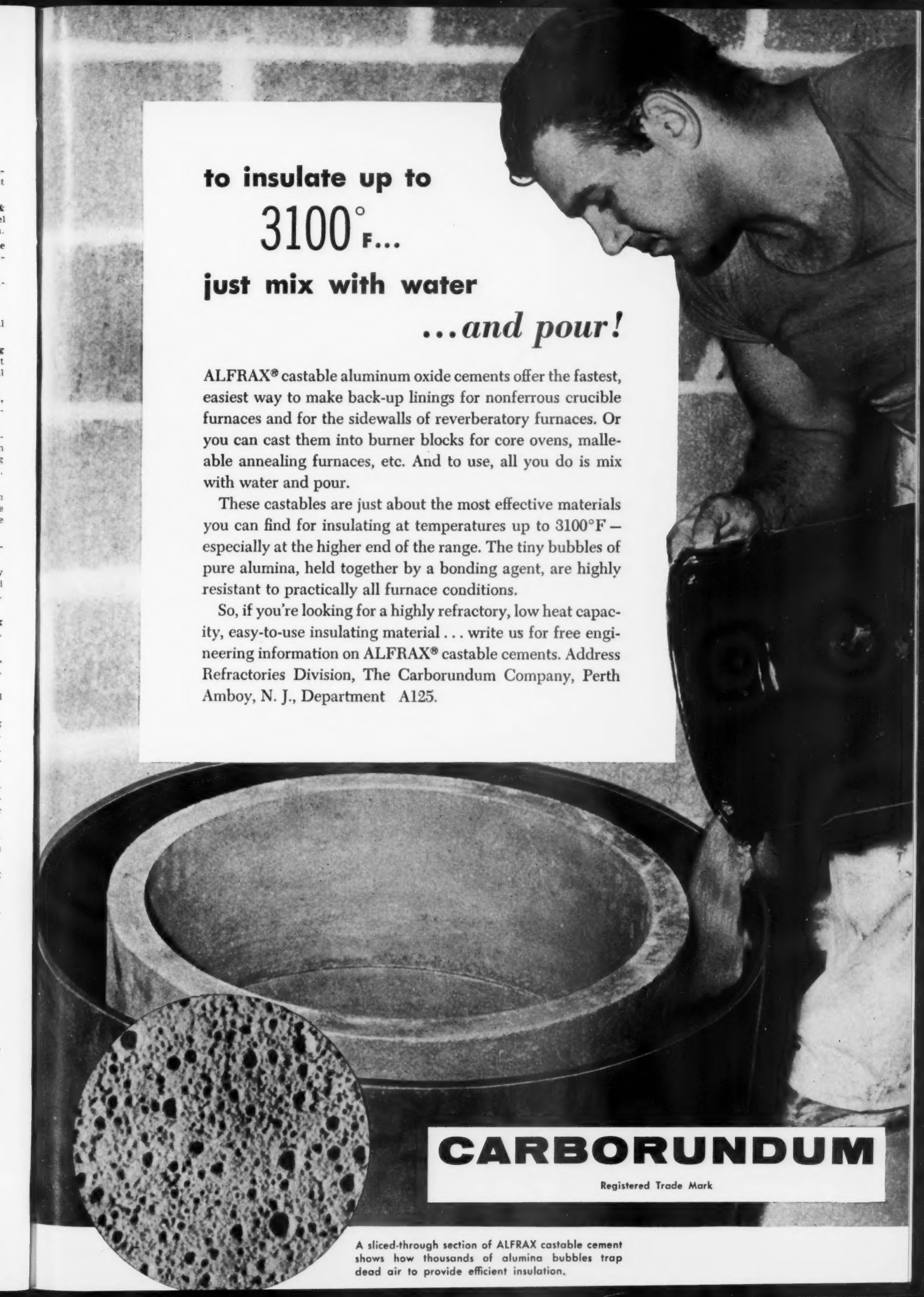
Sept. 24-25—Steel Founders' Society of America, annual fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Sept. 24-26—Material Handling Institute, fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 11-12—National Foundry Association, annual meeting, Detroit.

Oct. 18-20—Foundry Equipment Manufacturer's Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 30-Nov. 2—Gray Iron Founders' Society, annual meeting, The Homestead, Hot Springs, Va.



to insulate up to 3100°F...

just mix with water

...*and pour!*

ALFRAX® castable aluminum oxide cements offer the fastest, easiest way to make back-up linings for nonferrous crucible furnaces and for the sidewalls of reverberatory furnaces. Or you can cast them into burner blocks for core ovens, malleable annealing furnaces, etc. And to use, all you do is mix with water and pour.

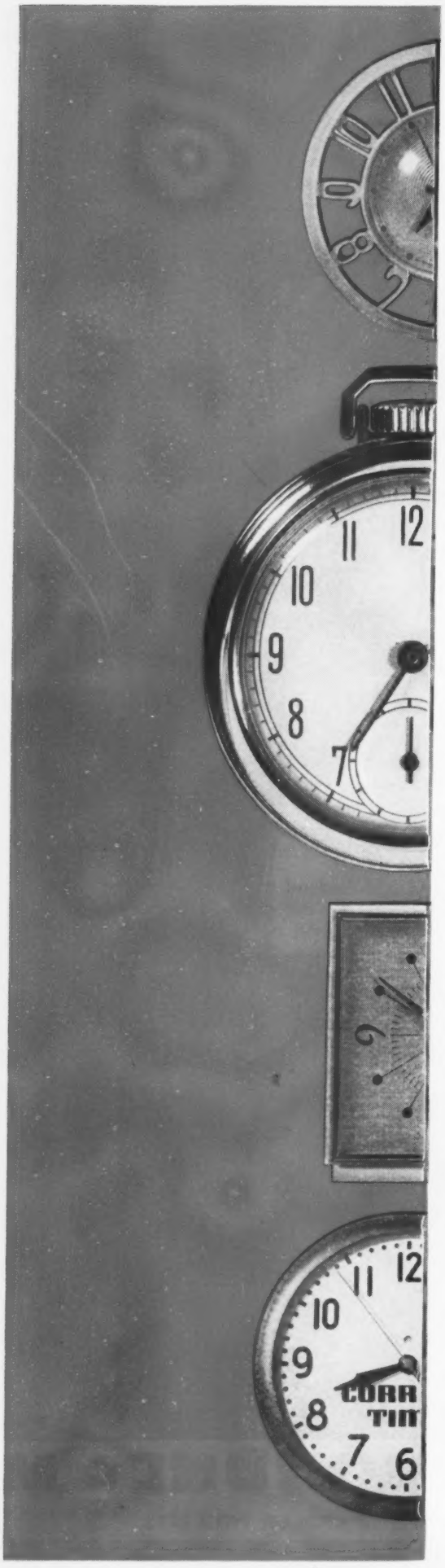
These castables are just about the most effective materials you can find for insulating at temperatures up to 3100°F — especially at the higher end of the range. The tiny bubbles of pure alumina, held together by a bonding agent, are highly resistant to practically all furnace conditions.

So, if you're looking for a highly refractory, low heat capacity, easy-to-use insulating material . . . write us for free engineering information on ALFRAX® castable cements. Address Refractories Division, The Carborundum Company, Perth Amboy, N. J., Department A125.

CARBORUNDUM

Registered Trade Mark

A sliced-through section of ALFRAX castable cement shows how thousands of alumina bubbles trap dead air to provide efficient insulation.



How to really cut snagging time in your cleaning room!

switch to

CINCINNATI

PD

Snagging Wheels

CHECK UP on the amount of time your cleaning room spends in snagging. You may find, like so many foundry men, that wasted snagging time is cutting sharply into your profits. And like more and more foundries every day, you'll want to switch to CINCINNATI (PD) SNAGGING WHEELS—the greatest grinding wheel development in years.

CINCINNATI (PD) WHEELS will absolutely cut snagging time in your cleaning room . . . saving you money four important ways:

- FASTER CUTTING – You can get more pounds of metal per hour with the grains and bonds specified by CINCINNATI for your jobs. Operators like the fast, easy cutting action of CINCINNATI (PD) WHEELS.

- SELF-DRESSING ACTION – The CINCINNATI (PD) WHEELS specified for your job by CINCINNATI abrasive engineers require few, if any, dressings. With the right grade wheel, new cutting grits are bared as soon as old grits get dull and inefficient.

- LONGER WHEEL LIFE – Through longer life of CINCINNATI (PD) WHEELS, users have reported almost *double* the production per wheel. One customer, using a portable grinder, gets almost *twice* the life with a CINCINNATI (PD) Flared Cup. Another user, snagging cylinder blocks on a swing frame, has increased the production per wheel 45% with (PD) WHEELS.

- POSITIVE DUPLICATION (PD) – "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

CINCINNATI (PD) WHEELS are made in vitrified and resinoid bonds for both ferrous and non-ferrous foundries and are available in a complete variety of sizes and shapes. *Yet these better, cost-cutting* CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

We'll be happy to prove to you how CINCINNATI (PD) WHEELS can increase your production and cut time and costs in your cleaning room. Just contact us and we'll send one of our representatives. Wire, write or telephone, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI
Grinding Wheels

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

Make shell molds faster... get more accurate castings... with RCI's

FOUNDREZ 7500

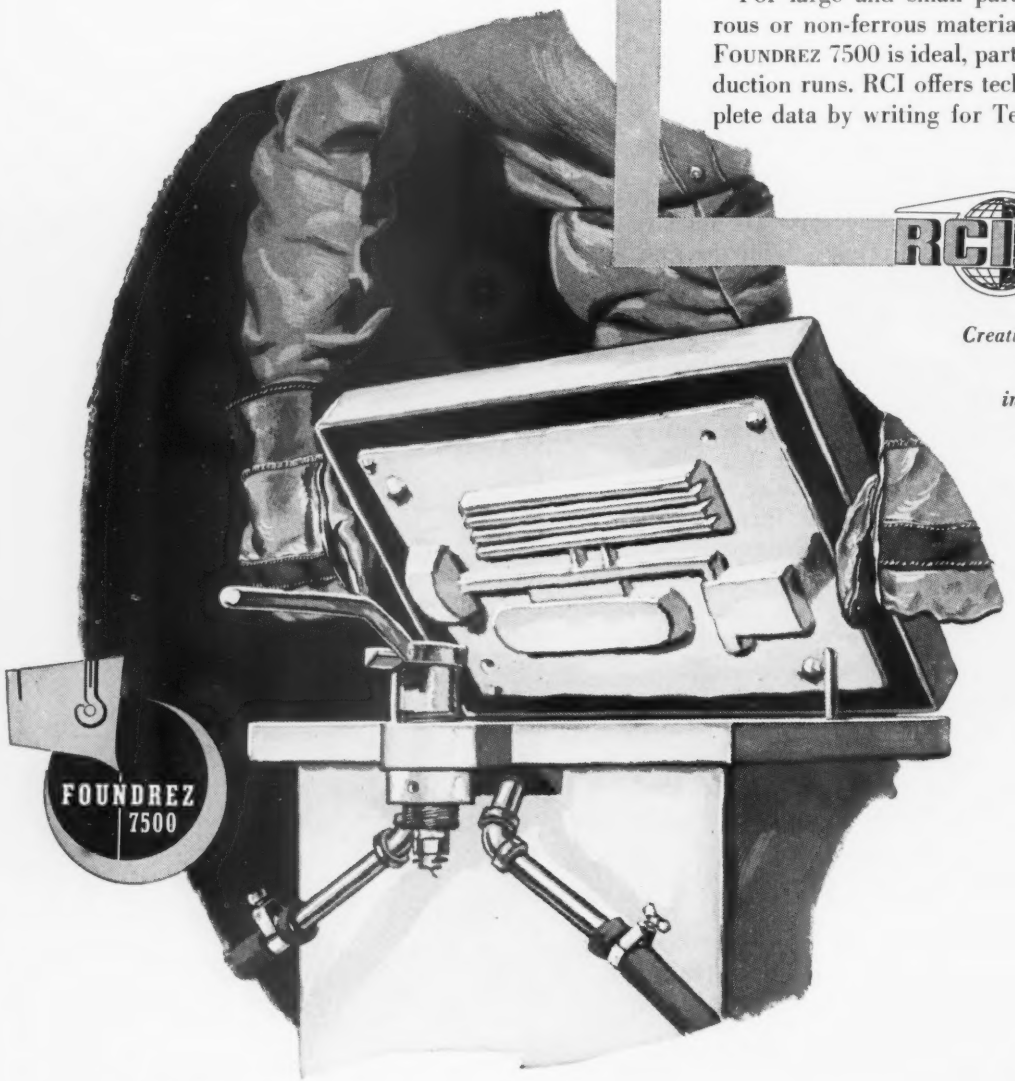
● You save — in *time*, in *labor*, in *materials* — when you make shell-molds with Reichhold's two-stage, thermosetting, powdered phenolic resin — FOUNDREZ 7500. You get castings so accurate that almost no machining is required . . . closely duplicating the actual pattern surface even in the most finely-detailed, thin-walled areas. Rejects are reduced to an absolute minimum.

When you produce shell-molds with FOUNDREZ 7500, curing is *faster*. This remarkable RCI resin takes extremely high oven temperatures, enabling you to turn out more molds per hour . . . molds of uniform superiority. They're structurally stronger, better able to vent gas, freer from distortion.

For large and small parts cast with any ferrous or non-ferrous material, shell-molding with FOUNDREZ 7500 is ideal, particularly for long production runs. RCI offers technical help. Get complete data by writing for Technical Bulletin F-3.

RCI

Creative Chemistry . . .
Your Partner
in Progress



The foundryman unclamps the pattern plate from the dump box. Notice the thin shell of partially-cured FOUNDREZ 7500 and sand clinging to the plate.

REICHHOLD

Synthetic Resins • Chemical Colors • Plasticizers • Phenol
Glycerine • Phthalic Anhydride • Maleic Anhydride • Sodium Sulfate
Sodium Sulfite • Pentaerythritol • Pentachlorophenol

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

QUALITY
ECONOMY
UNIFORMITY

QUALITY
ECONOMY
UNIFORMITY

QUALITY
ECONOMY
UNIFORMITY

Test after test shows YELLOWSTONE BENTONITE to be the best foundry bentonite

In test after test, Yellowstone Bentonite proved the best! Here are results of a report made by an independent research laboratory (name furnished on request). Yellowstone was tested and compared with three other commercial western bentonites. Common testing procedures were those recommended by the American Foundrymen's Society.

- ★ **Yellowstone produced highest green strength.**
- ★ **Yellowstone produced highest green permeability under all conditions.**
- ★ **Yellowstone had the highest green toughness.**
- ★ **Yellowstone was the most durable of the western bentonites.**
- ★ **Yellowstone was above the average of the bentonites tested in dry compressive strength.**
- ★ **Yellowstone produced better surface finish than other bentonites.**

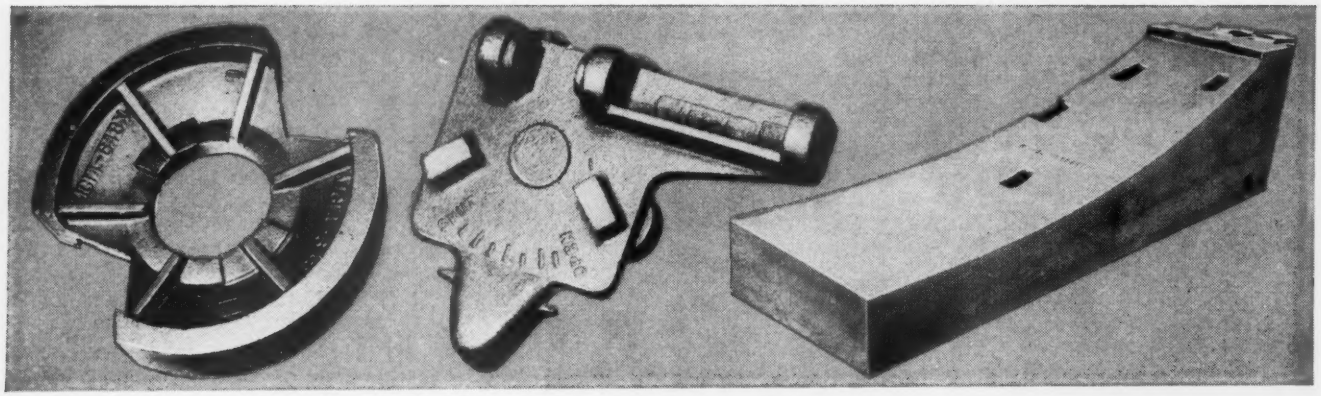
For quality, maximum economy, and assured uniformity every time, ask your distributor for Yellowstone Foundry Bentonite. It's the best bentonite on the market.

MAGNET COVE BARIUM CORPORATION

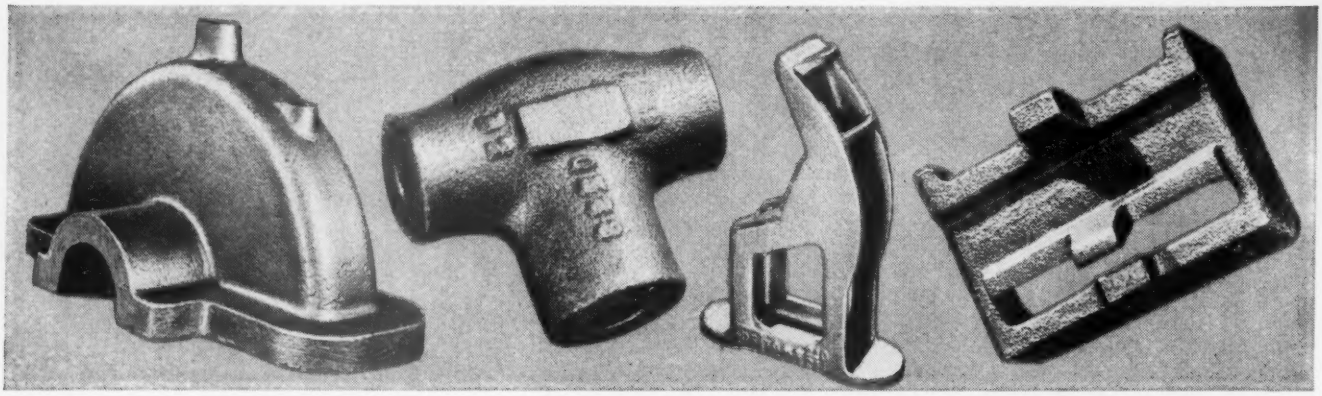
One of the Dresser Industries

Houston, Texas

LARGE OR SMALL, IRON OR STEEL,



WHEREVER METALS ARE CAST,



YOU CAN USE TRULINE® BINDER

Naval Stores Department **HERCULES POWDER COMPANY** INCORPORATED *920 King Street, Wilmington 99, Del.*

NF55-2

Shell molding in your future?

Shell cores are being used *more* and *more* in green sand molds. If shell molding is going to play a part in your foundry operations, now is the time to investigate the Nichols Sand Reclamation System. Nichols "Combination System"—wet scrubbing plus thermal processing—provides the only answer to effective, economical reclamation of shell sand—and conventional foundry sand.

To help you plan for the future and to guide our recommendation we maintain complete pilot plant facilities.

Write for Bulletin 222

Nichols Engineering & Research Corp.

70 Pine St., New York 5, N. Y.
1637 N. Illinois St., Indianapolis 2, Ind.
1477 Sherbrooke St., W., Montreal 25, Canada

Nichols

Sand Reclamation Systems

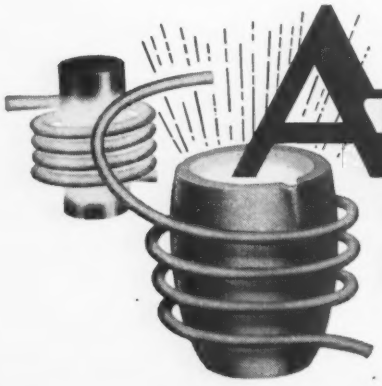
600 POUNDS OF BRONZE melted in 23 minutes

This steel and non-ferrous centrifugal-casting foundry saves more than time through the use of Ajax-Northrup induction furnaces. Freedom from contamination and almost complete metal recovery are direct results of the high speed characteristic of the Ajax-Northrup melting principle. Electrical energy, used as the source of power, is expended almost entirely in the charge. Little is wasted on the refractory lining or outside the furnace, thereby making working conditions better and more efficient at the same time.

Many Ajax-Northrup furnaces are made to accept either ferrous or non-ferrous work . . . with impressive savings for both. With non-ferrous alloys savings of over $33.00 a ton are reported in reduced metal losses alone. And for ferrous work, recovery is reported as high as 100% for nickel and 99% for chromium.

Economy recommends it, progress demands it; induction melting is fundamental to modern precision foundry work. Write for Bulletin 27-B . . . Ajax Electrothermic Corp., Trenton 5, New Jersey.

Associated Companies: Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.

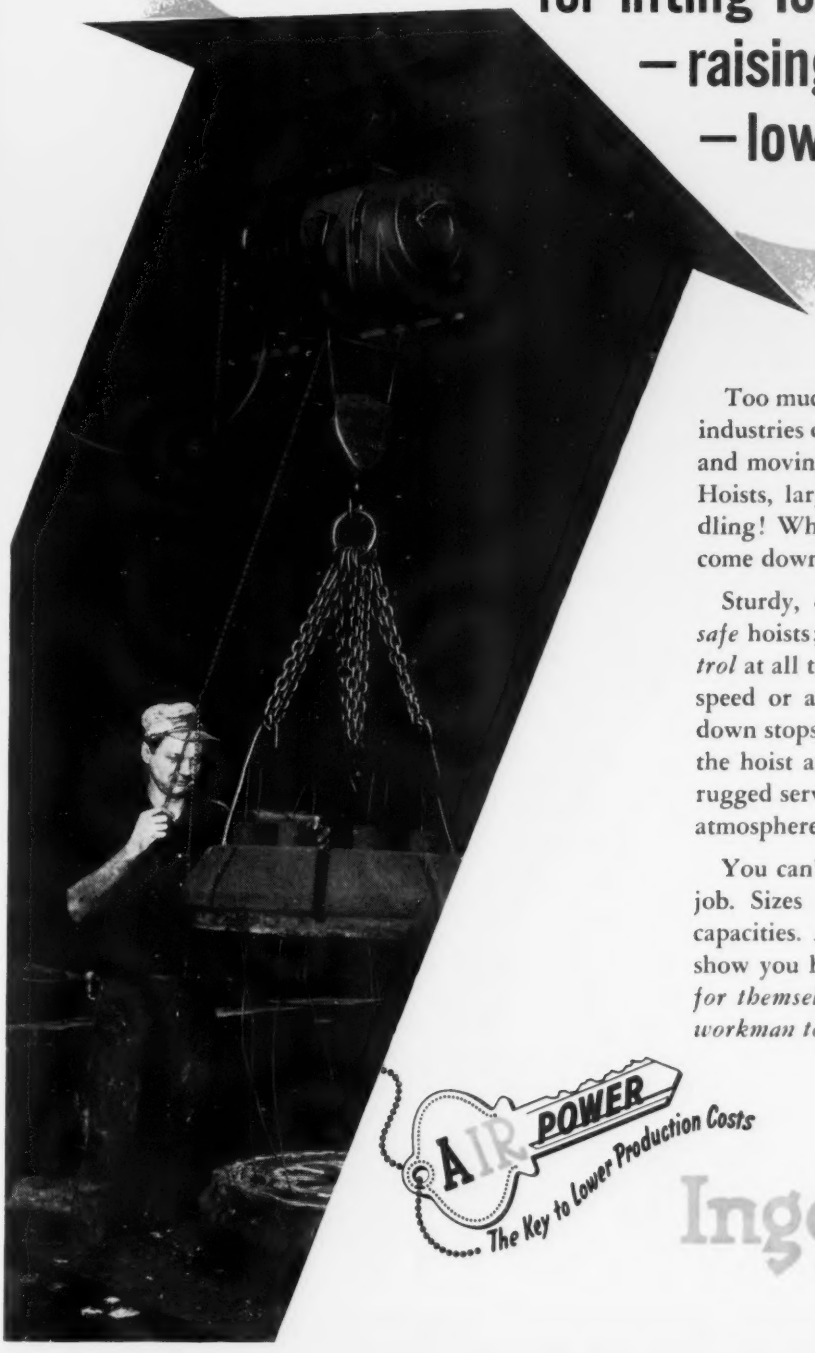


AJAX NORTHRUP SINCE 1916

INDUCTION HEATING-MELTING

compressed air has the *Lifting Power*

I-R Air Hoists have the *Reputation* for lifting loads and profits —raising output —lowering fatigue



Too much human energy is wasted in the nation's industries doing laborious and back-breaking lifting and moving jobs. Agreed? Then let I-R Air Motor Hoists, large and small, eliminate this costly handling! When you use them, output goes up, costs come down.

Sturdy, compact, foolproof I-R Air Hoists are *safe* hoists; because the operator has *complete control* at all times, whether the hoist is running at full speed or at the slowest crawl. Automatic up and down stops prevent damage through misuse to both the hoist and the load. I-R Air Hoists are fine for rugged service, and work just as well in hot gaseous atmospheres.

You can't go wrong when I-R Hoists are on the job. Sizes available from 200 to 20,000 pounds capacities. Ask one of our Air Tool Specialists to show you how *Air Hoists and Air Tools now pay for themselves nearly twice as fast and enable the workman to do more work with less effort.*

AIR POWER
The Key to Lower Production Costs

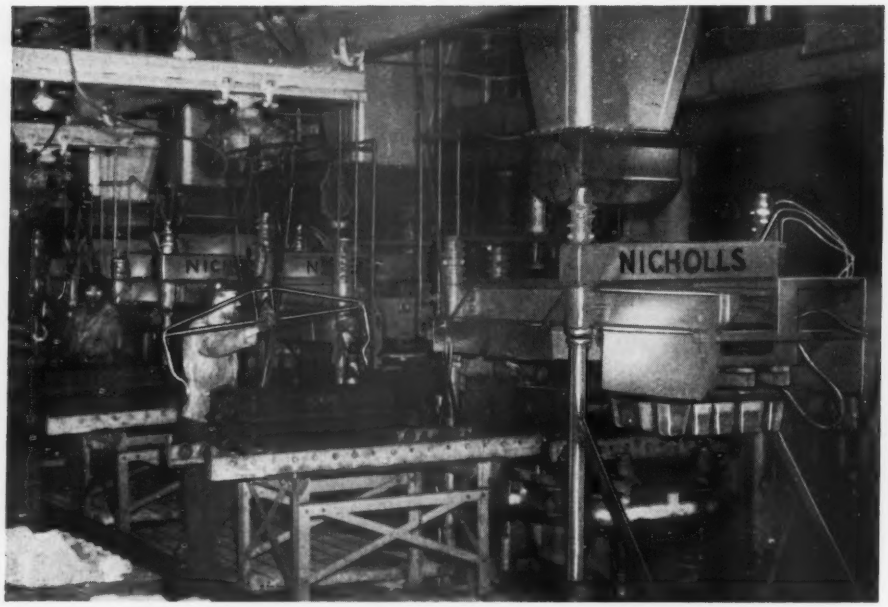
Ingersoll-Rand

11 Broadway, New York 4, N. Y.

539-8

FACT REPORT:

NICHOLLS MOLDING MACHINES are made to **last!**



A battery of NICHOLLS "push button" automatic molding machines in a large foundry.

here's why:

- **"Push-button" automatic control to eliminate dangerous risks.**
- **Precision-built for years of service.**
- **Quality construction for finer molds continuously.**
- **Fully automatic operation.**
- **Greater molding economy than you've ever known.**

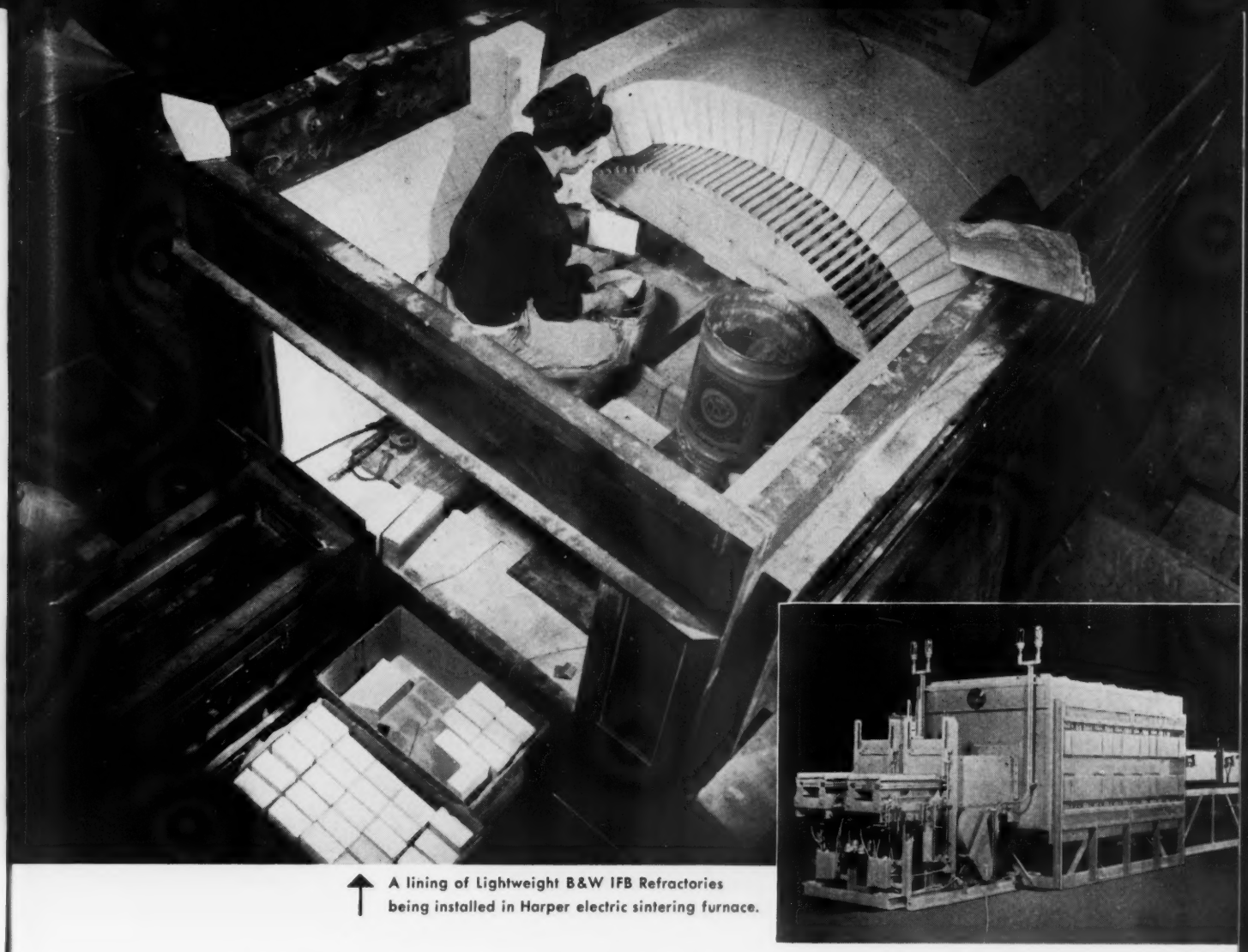
Manufacturers have depended on Nicholls equipment for **45 years**

There must be a reason why so many of the country's top manufacturers choose Nicholls equipment. And there is. It's the same reason why you will want to specify Nicholls Jolt-Squeeze and Pattern Draw Molding Machines—Ease and economy of operation, low maintenance costs—and the best possible molds every time.

For complete information, write:

WM. H. NICHOLLS CO., INC., RICHMOND HILL 18, LONG ISLAND, NEW YORK.

NICHOLLS



A lining of Lightweight B&W IFB Refractories being installed in Harper electric sintering furnace.

Refractories Maintenance Cut Down

ON HARPER ELECTRIC FURNACES AND KILNS

"Furnace linings that don't last as long as they should can shoot our customers' production costs 'sky high' —and take a big bite out of their profits."

That's one of the reasons why Harper Electric Furnace Corporation standardized on B&W Insulating Firebrick for the electric kilns and furnaces which they manufacture. They know from experience that "B&W IFB last longer than any insulating firebrick we ever tried."

The reason? Volume stable raw materials, unique quality control and manufacturing processes, including B&W's exclusive double burning at temperatures well above use limits—all these factors contribute to more uniform brick and longer life.

B&W IFB, the lightest weight insulating firebrick, also offer these advantages:

Cut electricity or fuel costs— Lighter in weight than any other insulating firebrick, B&W IFB store and conduct less heat. This means faster heating up time, less heat loss during furnace operation. Results? Lower electricity or fuel consumption —often 30% to 50% less than with ordinary heavy firebrick.

Cut installation costs — Hand fitting is easy and fast—B&W IFB can be cut, drilled or shaped on the job with ordinary hand woodworking tools.

Cut down-time — B&W IFB cool off quicker because they store less heat —make possible quick access to the furnace for inspection. Furnace gets back on the line faster, too, because B&W IFB heat up quickly.

These savings explain why B&W Insulating Firebrick are being used in thousands of applications . . . from the largest industrial furnaces to the smallest kilns. Contact your local B&W Refractories Engineer. He may point the way to new savings in your furnace.

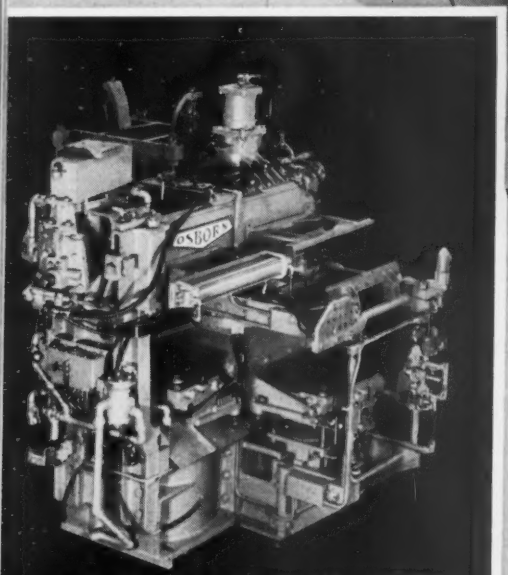
BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42ND ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

B&W REFRACTORIES PRODUCTS — B&W Allmul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars

N 494

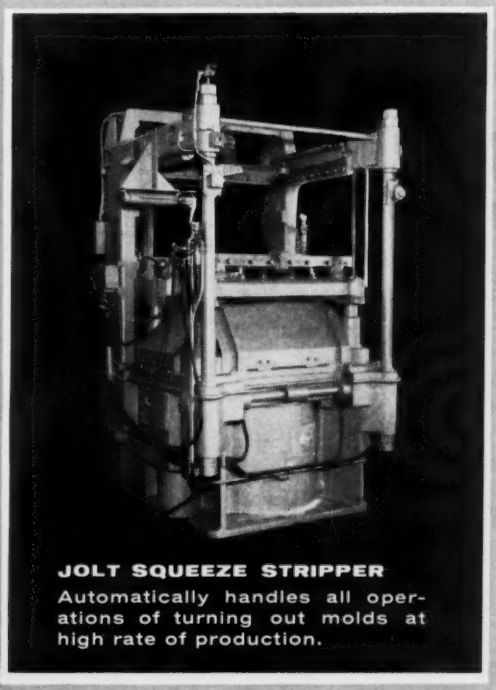
AUTOMATION.



MULTIPLE STATION AUTOMATIC MOLDER—Handles molds from loose sand to finished mold delivered on conveyor.

ROTO-CORE AUTOMATIC
makes five different or identical cores on one setup.

N. Osborn's answer to lower costs



JOLT SQUEEZE STRIPPER
Automatically handles all operations of turning out molds at high rate of production.

IN foundries, as in most industries today, mass-demand is necessitating mass production.

Automatic equipment—pioneered and engineered by Osborn—enables foundries to produce top-quality molds and cores on fast, predetermined, repetitive cycles. Molds and cores are uniform throughout the entire production run. The heavy-duty design of these precision machines virtually eliminates costly down-time and maintenance.

Ask an Osborn foundry specialist to show where you can cut mold costs, improve quality with . . . Automation by Osborn. Call or write *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Leader in automation for the foundry

OSBORN

CORE BLOWERS
MOLDING MACHINES
INDUSTRIAL BRUSHES

. . . AND GET *More* PERFECT CASTINGS

DELTA Z-KOAT and ZZ-KOAT Washes are easy to mix and easier to apply. After mixing, there is no danger of precipitation and, when dried, they are completely moisture-proof. Applied by swabbing, dipping or brushing, they adhere uniformly to the sand and produce smooth, highly-refractory surfaces.

Both DELTA Z-KOAT and ZZ-KOAT Washes have unusually high fusion points and, because of their high heat conductivity, provide a more rapid surface-metal set. Both washes are economical to use.

DELTA Z-KOAT contains zirconium plus other high fusion refractories and DELTA ZZ-KOAT is an all-zirconium type wash.

DELTA

Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.

DELTA
ZIRCONIUM WASHES
Z-KOAT AND ZZ-KOAT
DELTA OIL PRODUCTS CO.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

Looking for cheaper blast cleaning?

PANGBORN BLAST CLEANS CHEAPER BECAUSE famous Pangborn Rotoblast cleans *fast.* Rotoblast throws a heavy volume of abrasive quickly over a large surface area. This speed of operation increases your rate of production, cuts operating expenses.

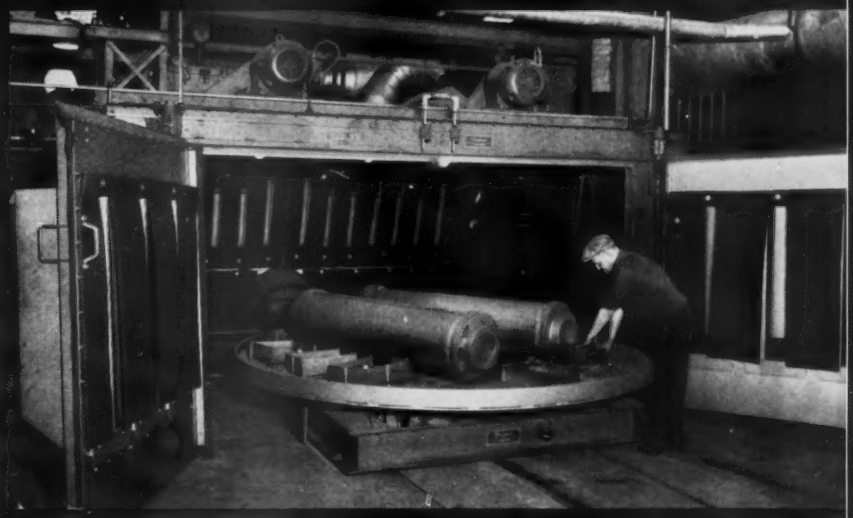
◄ BLASTMASTER Barrel for batch cleaning

Pangborn...

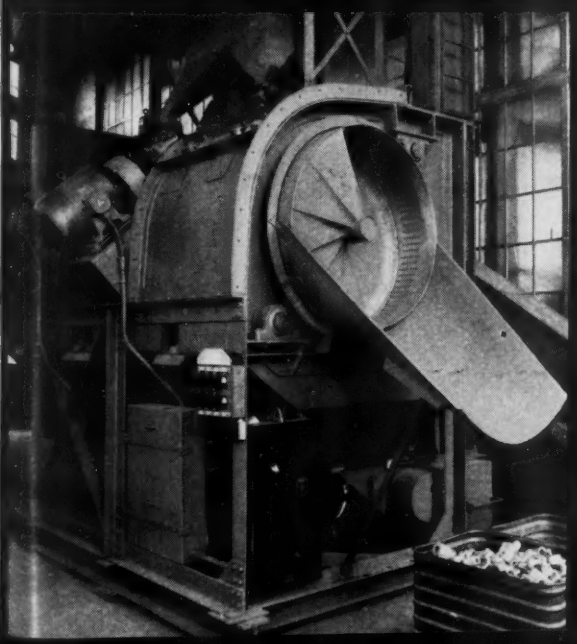
Pangborn...

PANGBORN BLAST CLEANS CHEAPER BECAUSE Rotoblast actually does a terrific job! Its uniform cleaning action economically produces a more desirable, brighter finish and allows more efficient use of high-speed machine tools in further processing.

ROTOBLAST ROOM for miscellaneous work ►



Pangborn...



PANGBORN BLAST CLEANS CHEAPER BECAUSE Rotoblast saves labor costs . . . because it requires less power to operate . . . because its versatility accommodates a wide range of work. Send for Bulletin 227 today. Write PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

◄ ROTOBLAST "GO" Barrel for continuous-flow requirements

Whatever Pangborn Rotoblast machine best suits *your* requirements . . .

Pangborn

BLAST CLEANS CHEAPER

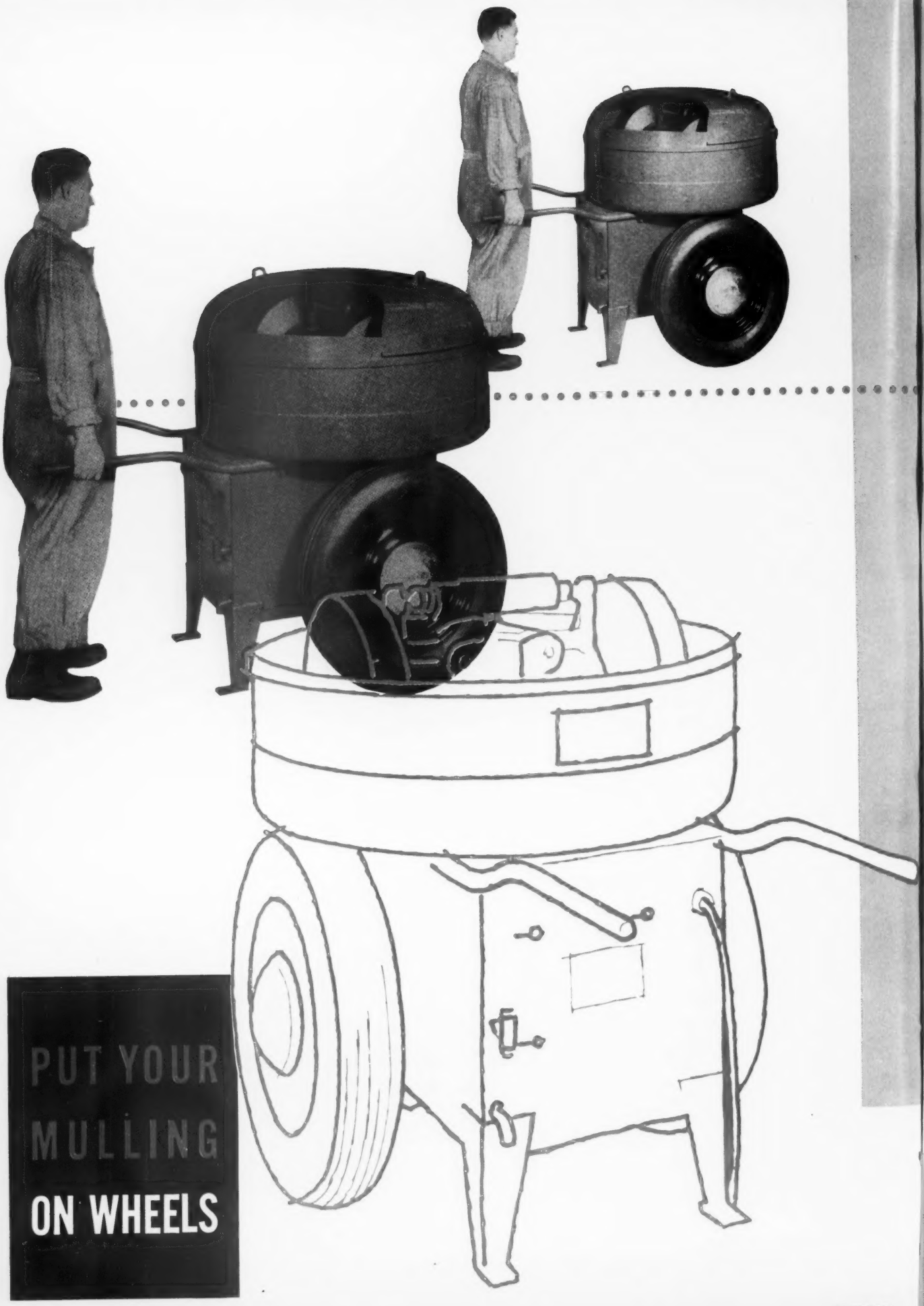
Rotoblast Blastmaster® & Continuous-Flo Barrel

Rotoblast Tables & Table-Rooms

Special Blast Rooms & Cabinets

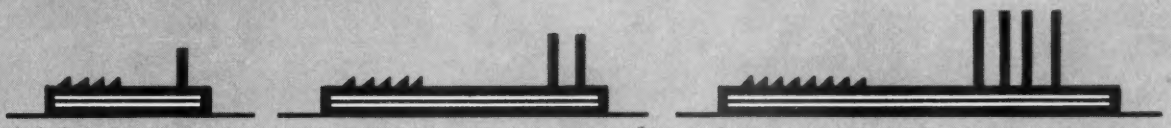
Pangborn Dust Control Equipment

Malleabrasive Shot & Grit



PUT YOUR MULLING ON WHEELS

ANY FOUNDRY HAS A JOB FOR SIMPSON Porto-Muller®



CO^2 process is another example of Porto-Muller versatility

Here's a completely self-contained, portable mixer "package" that can go anywhere in *any* foundry . . . to do a thorough *controlled* mixing job on any kind of sand.

From the toughest steel facing sand to the most intricate shell, "D" process or CO^2 sand—Porto-Muller handles them all! And it's built to the same high engineering standards that has paired the name Simpson with practical and dependably economical mixing practices for over 40 years.

The Porto-Muller is designed around the fact that it's cheaper and easier to bring the *muller* to small or special mixing jobs, than it is to bring the sand to the muller. That's why it's making real economy possible on hundreds of jobs where makeshift mixing practices formerly took a large toll in wasted core oils and binders. Pioneers in shell, "D" and CO^2 processing have relied on Porto-Muller, too—for dependably uniform blending of small batches.

Got a job for Porto-Muller? Whether it's a big one in a small foundry or a small job in a big foundry, Porto-Muller is a superior mixer on *any* job in *any* foundry . . . and it's a true package unit. You just plug it in and start mixing!

MIX ANY SAND, ANYWHERE IN YOUR SHOP

MOLDING OR FACING

Bentonite, Fire Clay, Cereal, Pitch, Gravel — Sand and binder are intimately blended. True mulling action disperses *all* binder, coats *each* grain.

CORE SANDS

oil or resin bonded — Intimate blending, maximum dispersion of expensive binders cuts costs while it improves finish and effective strength of core.

SHELL SANDS

dry bonded or liquid coated — Used by pioneers and recommended by leading resin producers. Fills popular capacity range . . . yet can be used for other jobs in shop. Effective mulling is the real answer to binder segregation problems.

SPECIAL MIXES

CO^2, Asphalt Base, Sulphate Liquors, Silicates, Gums — Spring loading arrangement permits adjustment of effective muller pressure to fit job at hand. Users report Porto-Muller ideal for use on new CO^2 formulas.

HERE'S A NEW BULLETIN ON THE PORTO-MULLER
It's just off the press . . . shows dimensions, specifications and testimonial reference. Write for your copy today!

National Engineering Company
(Not Inc.)
646 Machinery Hall Bldg. • Chicago 6, Illinois

Actual on-the-job performance in foundries has proven that the U. S. Royalite® line of snagging wheels is unexcelled. Job for job, specification for specification, the quality and the economy of Royalite's performance are being acclaimed by cost-conscious superintendents who have had an opportunity to use these wheels.

Consider a Midwest foundry. A change-over to Royalite Wheels resulted in savings of $9,300 per year. Pounds of metal removed per wheel is 15.5% higher than with any grinding wheels previously used!

Royalite answers the foundry's need for wheels that REDUCE THE COST OF OPERATION, INCREASE PRODUCTION, and maintain a high standard of safety because of greater strength and uniformity.

• • •

EXTRA DIVIDEND: Remember that when you buy wheels from United States Rubber Company you are buying direct and are being served by a specialist – a man whose only job is selling and servicing grinding wheels. It's his job to see that you get top value for every dollar you spend on grinding wheels.

US RUBBER

"U.S." Research perfects it . . . "U.S." Production builds it . . . U.S. Industry depends on it.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

Late News

BUSINESS BOOM: Business in general continues at a pace that assures setting of a number of new records for 1955 as a whole. Shipments of castings, however, will fall short of the peak 1951 total of 19¼ million tons. This year likely will end up with a figure around 18½ million. This would be 25 per cent ahead of 1954 and compares with an average for the last five years of slightly under 17 million.

Record shipments are indicated for a few types of castings. Aluminum casting deliveries through September topped the 12-month totals for eight of the last ten years. For all of 1955 shipments will be close to 400,000 tons. Considering that the average for the first five postwar years was only slightly over 200,000 tons, the recent surge in consumption of the light metal is impressive.

Malleable iron shipments have a fair chance of matching the 1951 record of 1,085,000 tons. For the first nine months they totaled 815,000 tons, and heavy automotive needs will bolster the fourth quarter figure. Motor car demand also has contributed to record production of zinc die castings this year. Shipments through September of about 275,000 tons compare with the previous record of 268,000 tons for all of 1950.

PIPE FOUNDRY: Warren Foundry & Pipe Corp. plans to complete by next spring a modern cast iron pipe shop at Phillipsburg, N. J. Using the deLavaud process, it will produce pipe 4 to 12 inches in diameter. Warren also operates a sand-spun cast iron pipe foundry at Everett, Mass.

EXPANSION: Locomotive Finished Material Co., Atchison, Kans., has been granted a certificate of necessity for accelerated tax amortization by the Office of Defense Mobilization for steel casting facilities to cost $528,000. This permits the company to depreciate 50 per cent of the increased facilities under the five-year rapid tax schedule.

TO ACQUIRE FOUNDRY: General Steel Casting Corp.'s directors have approved a plan to acquire outstanding shares of National Roll & Foundry Co., Avonmore, Pa., in exchange for about 15,600 shares of General Steel common. National Roll would be operated as a subsidiary of General Steel. The former makes rolling mill rolls.

CHICAGO GROUP ELECTS: John R. Shumway, partner, C. W. Shumway & Sons, Batavia, Ill., was elected president of the Chicago Foundrymen's Association at its annual meeting, Nov. 17. J. K. Hodgson, secretary, Hodgson Foundry Co., Chicago, was elected vice president. R. H. Lehmpuhl, secretary, Sheffield Foundry Co., Chicago, was re-elected secretary-treasurer and H. R. Erickson, assistant treasurer, Noonan-Malmstrom Co., Chicago, was named a director. The association's office is at 343 Dearborn St., Chicago, with Mildred Kosar as executive secretary.

MERGER COMPLETED: Link-Belt Co., Chicago, has completed an exchange of shares between it and the Syntron Co., Homer City, Pa. Syntron, manufacturer of feeders and other equipment for movement of materials, as well as selenium rectifiers and portable power tools, will be operated as a Link-Belt subsidiary.

MERGER OFF: Catalin Corp. of America and Reichhold Chemicals Inc. have jointly announced that negotiations looking toward a merger of their two companies have been discontinued.

TITANIUM PRICE CUT: Titanium Metals Corp. of America has reduced the price of titanium sponge 30 cents a pound to $3.45, effective Nov. 23. The last price cut was 20 cents a pound on Nov. 1.

PERSONALS: David C. Ekey, recently assistant professor and since 1951 head of the foundry option course at Pennsylvania State University, has been appointed director of research, Lebanon Steel Foundry, Lebanon, Pa. . . . Grant S. Diamond, president, Electro Refractories & Abrasives Corp., Buffalo, is the new president of the Grinding Wheel Institute . . . Gordon Ley has been appointed district representative serving the Colorado area by Electric Steel Foundry Co., Portland, Oreg.

Ernest J. Stockum, vice president of the

Dayton Malleable Iron Co., Dayton, O., and for a number of years general manager of its G. H. R. Foundry Division, has been made vice president in charge of research and development. B. D. Claffey, for the past year general manager of the company's Ohio Malleable Division in Columbus, has been transferred to G. H. R. as general manager. D. L. Mains, recently assistant to Mr. Claffey in Columbus, has been made general manager of Ohio Malleable Division.

BOOSTS CAPACITY: Superior Steel & Malleable Castings Co., Benton Harbor, Mich., has completed installation of an 8-ton electric arc furnace. The company also has a 3-ton electric furnace and a 15-ton open-hearth unit for melting steel.

COMPLETES EXPANSION: Accurate Die Casting Co., Cleveland, has increased its production capacity more than 40 per cent with the completion of two new plants and an expansion of existing tool and die room facilities. This adds 23,500 square feet of space. One new plant is devoted to magnesium die castings, the other to aluminum die castings. The company also produces zinc die castings.

MOVES OFFICE: After Dec. 2 the general office of American Steel Foundries will be in new quarters at the Prudential Plaza, Chicago 1. Headquarters recently have been at 410 North Michigan Ave.

MISCELLANY: Master Pattern Co., formerly located at Cleveland, is in new quarters at Huron Avery Rd., Huron, O., and now is known as the Huron Mfg. Co. . . . Detroit Harvester Co. has bought Peters-Dalton Co., both of Detroit, producer of spray booths, washers and ovens . . . Bunting Brass & Bronze Co., Toledo, O., has purchased Detroit Sintered Metals Corp., Detroit . . . Acra-Cast Foundries have moved from Huntington Park, Calif., to 1031 South Santa Fe, Compton, Calif. . . . Acme Foundry & Machine Co. has been formed to manufacture brass and aluminum plumbing goods at 1424 East 28th St., Chattanooga, Tenn. . . . Coreroom, machine shop and office of the Slinger Foundry Co., Slinger, Wis., were damaged by fire Nov. 17.

Prices of Foundry Metals and Coke

(As of November 25, 1955)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$16.00-17.00
OVEN	
Birmingham	$24.40
Buffalo	25.75
Chicago	25.75
Detroit	26.25
Erie, Pa.	25.00
Indianapolis	25.50
Kearny, N. J.	25.50
Lone Star, Tex	19.50
Milwaukee	26.25
Montreal, Que.	27.25
New England, deld.	27.05
Painesville, O.	26.25
Philadelphia	25.00
St. Louis, deld.	26.00
St. Paul	25.00
Swedeland, Pa.	25.00
Terre Haute, Ind.	25.50

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$61.00	$61.50
Birmingham	55.00	....
Buffalo	59.00	59.50
Chicago	59.00	59.00
Cleveland	59.00	59.00
Duluth	59.00	59.00
Erie, Pa.	59.00	59.00
Everett, Mass.	65.00	63.00
Fontana, Calif.	62.50	....
Geneva, Utah	59.00	....
Granite City, Ill.	60.90	61.40
Lone Star, Tex	55.00	....
Neville Island (Pittsburgh)	59.00	59.00
Steelton, Pa.	61.00	61.50
Swedeland, Pa.	61.00	61.50
Toledo, O.	59.00	59.00
Troy, N. Y.	61.00	61.50
Youngstown, O.	....	59.00

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 41.00; tin bronze, No. 225, 54.00; No. 245, 47.25; high-leaded tin bronze, No. 305, 44.75; No. 1 yellow, No. 405, 32.75; manganese bronze, No. 421, 36.25.

ALUMINU: 99 per cent plus primary ingots 24.40. Secondary No. 12 alloy 30.50-30.75. Deoxidizing grades: No. 1, 31.25-32.25; No. 4, 29.00-30.00.

MAGNESIUM: 99.8 per cent notched ingots 33.25, f.o.b. Freeport, Tex. (10,000 lb or more).

COPPER: Electrolytic 43.00 delivered Connecticut valley.
ZINC: High grade 14.35 delivered. Die casting alloy no. 3, 17.50 delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$40.00-41.00	**$47.50-48.00	.....	.....	.....	.....	$59.00-60.00
Boston*	**37.50-40.00	**36.00-36.50	.....	.....	**39.00-39.50	.....	.....
Buffalo	43.00-44.00	**40.00-41.00	.....	.....	**43.00-44.00	.....	51.00-52.00
Chicago	44.00-47.00	48.00-49.00	.....	51.00-52.00	51.00-52.00	57.00-58.00	60.00-62.00
Cincinnati*	**41.00-42.00	**43.50-44.50	**41.00-42.00	.....	**49.00-50.00	.....	60.00-61.00
Cleveland	45.00-46.00	48.00-49.00	37.00-38.00	48.00-49.00	50.00-51.00	53.00-54.00	62.00-64.00
Detroit*	**40.00	**40.00	**32.00	**44.00	.....	**35.00	.....
Los Angeles	39.00	**43.00-45.00	.....	.....	.....	.....	.....
New York*	42.00-42.50	37.00-38.00	39.00-40.00	.....	.....	.....	.....
Philadelphia	48.00	44.00-47.00	47.00	.....	52.00-53.00	61.00	.....
Pittsburgh	45.00-46.00	42.00-43.00	42.00-43.00	.....	51.00-52.00	.....	60.00-62.00
St. Louis*	38.50	46.50	37.00	47.00	.....	.....	60.00
San Francisco	39.00	47.00-48.00	36.00	45.00	48.00	.....	.....
Seattle	44.00	**43.00	**38.00	**40.00	.....	.....	.....

* Brokers' buying prices. **F.o.b. shipping point

For Cleaner Surfaces, Better Shakeout, Try WHITEHEAD'S NEW LYQUAFLOUR

Our new plant has just been completed at Irwin, Penna., to produce the new DOUBLE-STRENGTH LYQUAFLOUR. This compound of a special hydrocarbon and weathfloor improves castings and mold conditions for all types of metals. Highly recommended for the advantages listed below:

- One sand additive controls both peel and expansion
- Good shakeout saves sand
- Imparts highest flowability to sand mixture to give pattern true finish
- 2% initial treatment of sand and as little as ¼ of 1% to reactivate does the job
- Replaces any carbon or hydrocarbon materials now used
- Eliminates dust at the muller
- Castings peel excellently which reduces cleaning room time
- Reduces penetration and burn-on
- Overcomes sand expansion defects, maintains good compression strength
- Improves molding, "feel", and "moldability"
- No rigid control required
- Permits hard ramming
- Less ramming required, more molds per hour
- Less temper water needed

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
17 Exchange Place, Providence, R. I.

Manufacturers of

LYQUAFLOUR
For cleaner surfaces, better shakeout

JOINT SEAL
Plastic compound for perfect seating

LYQUAFACE
The liquid sand grain coating

DOB-IT
Ready-to-use core mudding compound

3 BEST BUYS *for* FOUNDRY PROFITS

LYQUAFLOUR
HYGEIA SEACOAL
LYQUAGRIP

WHITEHEAD BROTHERS COMPANY
324 West 23rd St. New York 11, N.Y.

HYGEIA SEACOAL WINS BY 800 TO 1 IN DUST COUNT TEST by Independent Industrial Health Laboratory

Keep Your Foundry Dust–Free. Enjoy These Positive Advantages

1. Permanently dust-free
2. Cleaner Handling
3. Less material lost
4. Better Volatile Sooting Better Peel
5. More economical

Ask for a demonstration of our SCATTER PATTERN TEST showing the marked difference in dustiness between Hygeia Seacoal and ordinary seacoal

Write for Literature

"A dust count was made by the investigator confined with the following results:

Samples collected from 3½ to 10½ minutes after dispersion —

656 million particles of Regular Seacoal per cu. ft. of air.

1 million particles of HYGEIA SEACOAL per cu. ft. of air."

"This means 800 particles of Regular Seacoal in the air as compared to 1 particle of HYGEIA SEACOAL

Samples collected from 10½ to 30½ minutes after dispersion —

328 million particles of Regular Seacoal per cu. ft. of air.

1 million particles of HYGEIA SEACOAL per cu. ft. of air."

"480 particles of Regular Seacoal to 1 particle of HYGEIA SEACOAL

"The counts of less than one million particles represents the range of normal clean air and the small differences between counts below one million are not considered significant."

HYGEIA SEACOAL SOLD UNDER UNCONDITIONAL GUARANTEE TO CONFORM TO OUR CLAIMS.

AIR USING HYGEIA SEACOAL

AIR USING REGULAR SEACOAL

Whitehead Brothers COMPANY

Established 1841

"Facemols", Shake-On, Spray-On, Hygeia Seacoal, Hygeia Pitch, Blended Core Compounds

Get ALL THESE 12 ADVANTAGES IN ONE READY-TO-USE CORE PASTE

LYQUAGRIP®

1. Ready mixed, uniform at all times
2. Light colored, odorless, non-corrosive, non-fermenting
3. Dries rapidly at room temperatures
4. Unaffected by normal storage
5. Will not boil or blister
6. No appreciable gas generation
7. Pasted joints are stronger than core
8. Unaffected by mold humidity
9. Will not harm steel, brass, bronze
10. Extra strong, uses 1 3 to 1 5 as much paste
11. Cores may be reheated without damaging pasted joints
12. Washes off hands and tools easily with warm water

Send for Literature

• Trade Mark Reg.

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
17 Exchange Place, Providence, R. I.

Manufacturers of

LYQUAFLOUR
For cleaner surfaces, better shakeout

JOINT SEAL
Plastic compound for perfect seating

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The liquid sand grain coating

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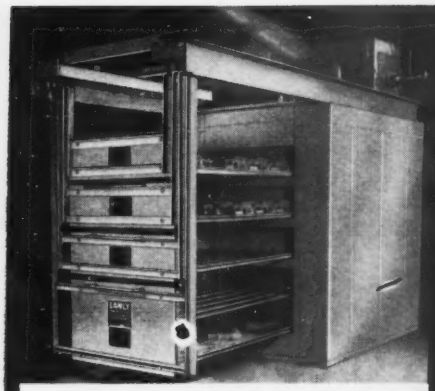
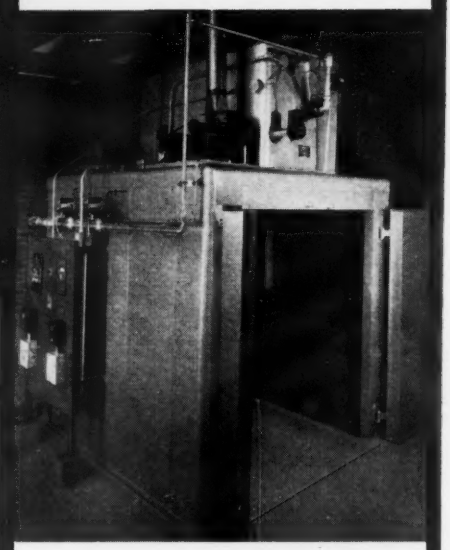
Ready-to-use core mudding compound



Drawer, . . .

. . . Rack, or



Car Type OVENS . . .

In your Foundry a LANLY Installation . . .

Will aid in . . .

Reducing Fuel Costs, Reducing Handling Costs, Improving Production Quality, Increasing Production

FASTER, BETTER and LESS COSTLY PRODUCTION . . . Time worn words to be sure, but what Foundry today would not welcome this in view of increasing competition, labor costs and more demands upon its facilities.

There is no better time than NOW to examine your production operations.

Check your ovens! Are they fuel eaters, heat losers or core spoilers? Ask the men who operate them!

Chances are you'll find unexpected revelations that will merit a phone call or letter to us.

We'll be pleased to discuss your problems without obligation.

WRITE FOR THE LATEST CATALOG AND FACTS ON ANY INSTALLATION

LANLY
FOUNDRY OVENS
THE LANLY COMPANY • 780 PROSPECT AVE
CLEVELAND, OHIO

Look at what's new in low-cost freight car moving!

WHITING Presents the New Heavy-Duty TRACKMOBILE®

Here's power and ruggedness for moving freight cars at *low* cost! The new Heavy-Duty Trackmobile makes *tough* jobs *easy*. Clogged sidings, bottlenecks and heavy traffic present no problem. Drive the Trackmobile on road wheels to the track —transfer to rail wheels—couple—then pull those heavily loaded cars! The Trackmobile speeds up switching, spotting, hauling . . . keeps shipping operations on the move . . . provides *new* flexibility. Designed for *continuous* 24-hour service—day or night—rain or shine. Look to the new Heavy-Duty Trackmobile *now* as a way to make important cost reductions!

WHITING CORPORATION

15607 Lathrop Avenue, Harvey, Illinois

Manufacturers of CRANES • TRAMBEAM • FOUNDRY, RAILROAD AND CHEMICAL EQUIPMENT

The Trackmobile principle of operation has been proved in hundreds of applications in scores of industries.

Transfers from road to track, or back again, in less than two minutes! On track it pulls railroad cars . . . on road it pulls skids, carts or portable equipment.

Write today for the new Heavy-Duty Trackmobile Bulletin T-115. Give us an idea of your individual freight car handling problems, and we'll be glad to suggest ways the Trackmobile can save you both time and money.

Guarantee TOP Performance and Maximum Life!

Specify THESE TOP QUALITY FEATURES...

(Standard on Miller Cylinders at no extra cost)

Specify CASE HARDENED CHROME PLATED PISTON RODS

On all Air and Hydraulic Cylinders

Benefits To You

CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences. ***Available from Miller at no extra cost.***

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust. ***Available from Miller at no extra cost.***

Specify "TEFLON" WIPERS

On all Air and Hydraulic Cylinders

Benefits To You

"TEFLON" Rod Wipers and "TEFLON" Hydraulic Piston Rod Seals withstand temperatures from—100°F. to plus 500°F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use. ***Available from Miller at no extra cost.***

Specify TEFLON HYDRAULIC ROD SEALS

On all Hydraulic Cylinders

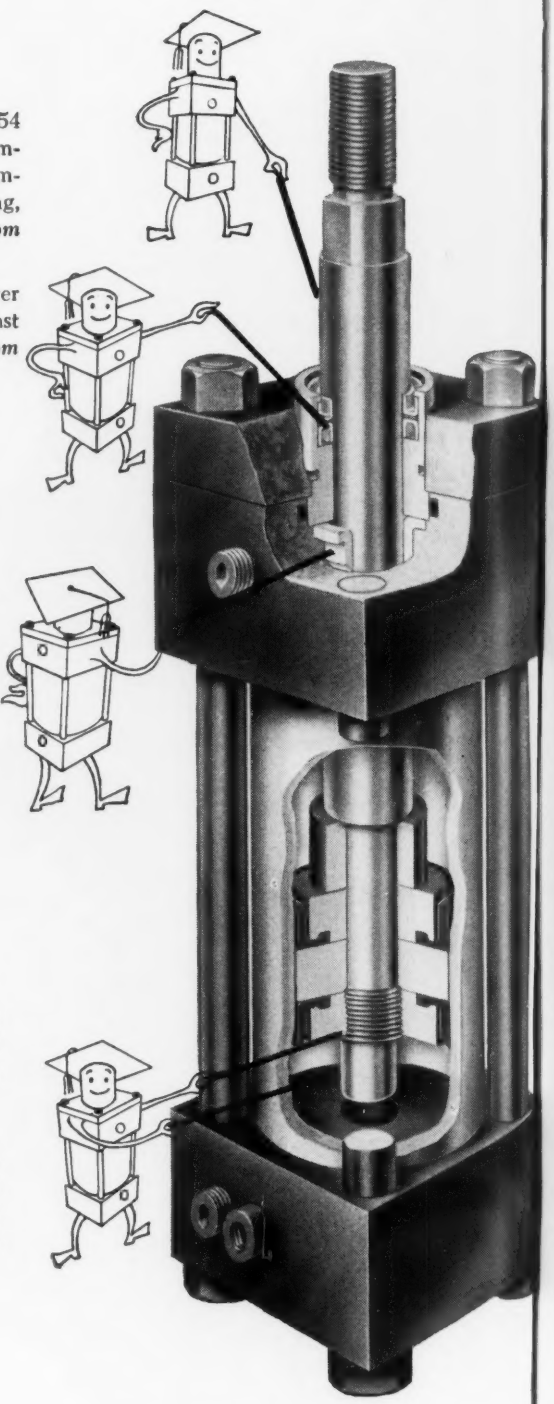
Specify RUST RESISTANT SURFACES

On all Air and Hydraulic Cylinders

Benefits To You

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, tie rods, and the unplated portions of the piston rods have this finish ***at no extra cost on all Miller cylinders.*** (This finish not recommended for water service)



You may wish to route this entire page to the proper department in your company, by using this handy form. Additional copies on request. →

To (Dept.) _____

"On all our future cylinder requirements, please specify the above quality features."

Signed _____

Title _____

EFFECTIVE DATES

These new Miller features will be provided at no extra cost after January 1, 1956—and at Miller's option prior to that date.

SALES AND SERVICE FROM COAST TO COAST

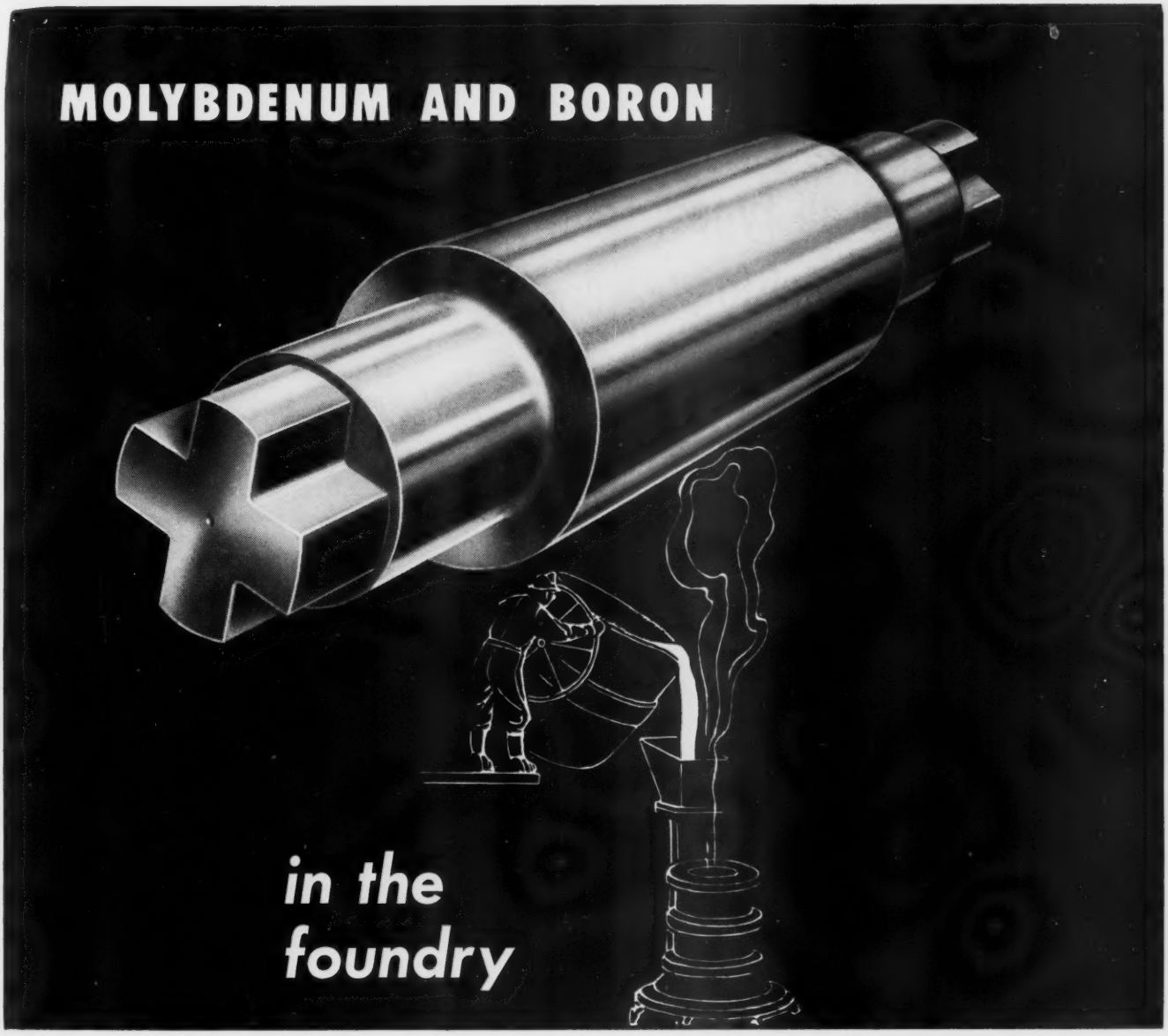
CLEVELAND • YOUNGSTOWN • DAYTON • TOLEDO • CINCINNATI • COLUMBUS
PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY
BUFFALO • ROCHESTER • MINNEAPOLIS • GRAND RAPIDS • DETROIT • FLINT
FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE
KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE
DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • ATLANTA
TORONTO, CANADA and OTHER AREAS

Miller

MILLER FLUID POWER CO.

2034 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMU
COUNTERBALANCE CYLINDERS



Rolls are among many cast, wrought iron and steel products that have been improved by Molybdenum and Boron. Very small additions, properly introduced, yield surprising results. MCA Molybdenum additions increase the resistance of rolls to breakage, chipping, heat checking and spalling in service. Molybdenum and Boron improve toughness and hardness qualities at both room and higher temperatures.

Similarly, Molybdenum and Boron are effective in improving toughness and hardness in both light and heavy iron and steel castings.

As recognized authorities in the application of Molybdenum, Tungsten, Boron, Cerium and its derivatives both as alloys and chemicals, MCA assures confidential and immediate reponse to inquiries.

MOLYBDENUM

CORPORATION OF AMERICA

Grant Building **Pittsburgh 19, Pa.**

Offices: Pittsburgh, Chicago, Detroit, Los Angeles, New York, San Francisco
Sales Representatives: Edgar L. Fink, Detroit; Brumley-Donaldson Co., Los Angeles, San Francisco
Subsidiary: Cleveland Tungsten, Inc., Cleveland *Plants:* Washington, Pa., York, Pa.

MCA

Lindberg-Fisher manufactures all types of Aluminum Melting and Holding Furnaces for permanent mold application— Gas-Oil- Electric resistance.

Lindberg-Fisher engineers can intelligently recommend the type of furnace to best suit your needs and conditions.

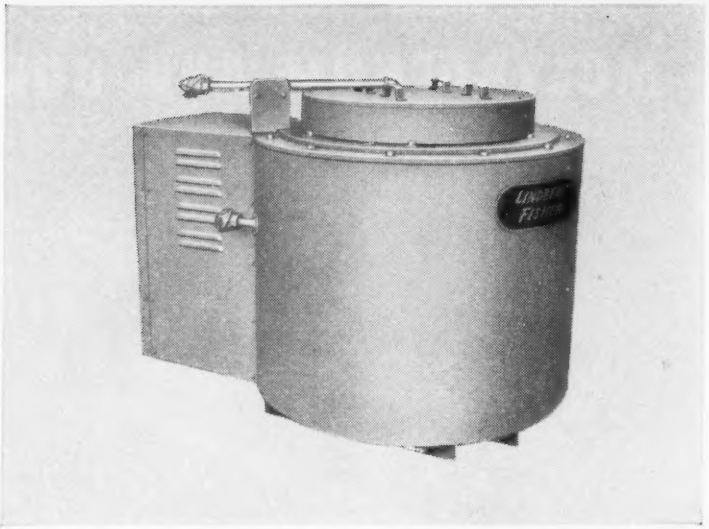
Melting specialists for 25 years

Sales and service offices in principal cities

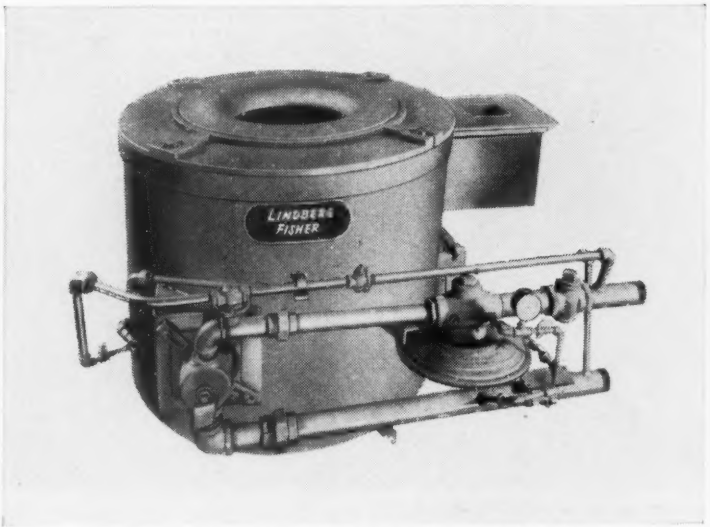
LINDBERG FISHER

MELTING FURNACES

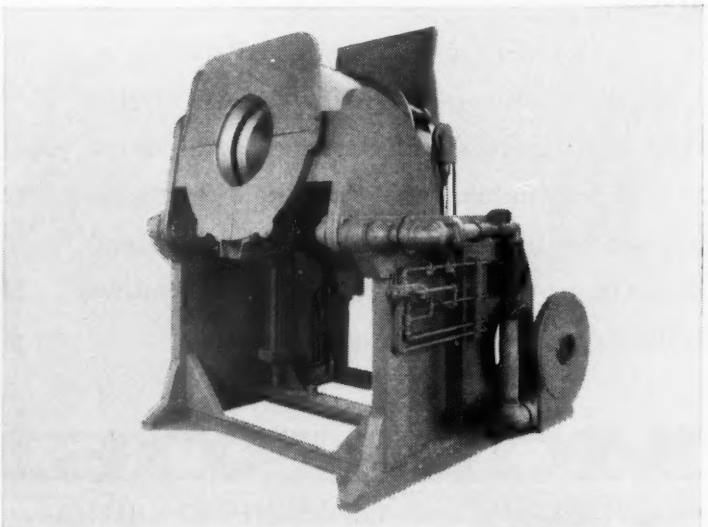
A Division of Lindberg Engineering Company,
2453 West Hubbard Street, Chicago 12, Illinois



Lindberg-Fisher Electric Resistance Aluminum Melting and Holding Furnace equipped with heavy duty resistance elements which give uniform distribution of heat, insuring long element and pot life. Capacities up to 1000 lbs. Described in Bulletin 320.

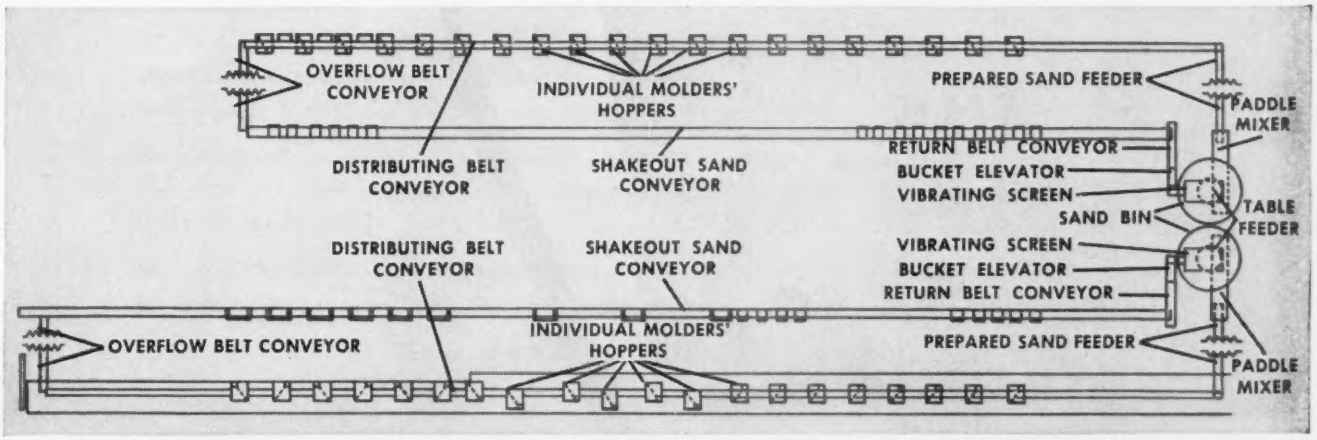


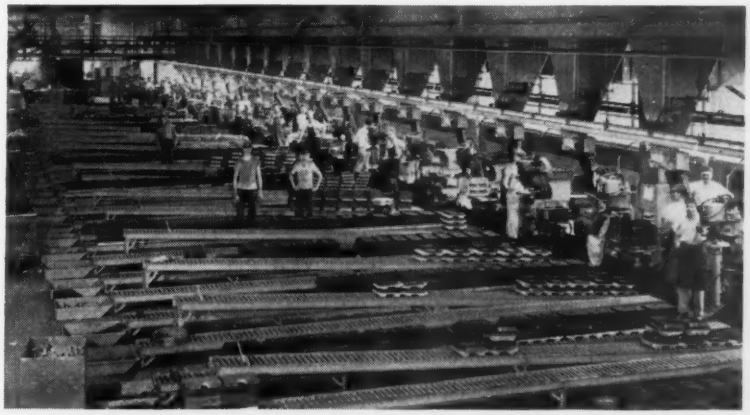
Lindberg-Fisher type ADC Aluminum Melting and Holding Furnace. Capacities up to 1000 lbs. of aluminum. Oil or gas fired. Described in Bulletin 301.



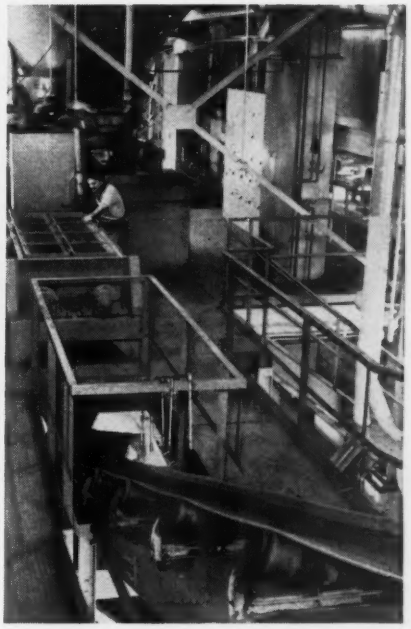
Lindberg-Fisher type HNP Hydraulic Nose-Pour Tilting Crucible Furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to 1000 lbs. of aluminum. Oil or gas fired. Described in Bulletin 57-A.

Now 3 Crouse-Hinds foundries are LINK-BELT mechanized





▲ At squeeze molding side of Crouse-Hinds' Syracuse aluminum foundry, sand travels on Link-Belt distributing belt conveyor over molders' hoppers. Overflow sand is carried on Link-Belt cross belt conveyor in background to shakeout belt conveyor, which is also fed by hoppers at foot ends of roller conveyors.



Link-Belt equipment on sand preparation floor includes storage tank, revolving plate feeder, double paddle mixer and inclined belt conveyor delivering to distributing belt conveyor. Operation involves two similar systems, each feeding 20 molders' hoppers at a capacity of 35 tph of prepared sand. ▶

New Syracuse aluminum foundry gets modern sand handling system

LINK-BELT mechanization reduces unit costs . . . speeds production . . . betters working conditions. And Crouse-Hinds has proved it — *three times since 1928.* The most recent installation — in their Syracuse aluminum foundry — provides low-cost sand handling. Sand is moved mechanically through preparation, molding, shakeout and reconditioning.

If your castings output is limited by an outdated handling system, Link-Belt mechanization is the answer. Your foundry may be large or small — gray iron, steel, malleable or non-ferrous. Whatever your requirements, Link-Belt equipment and proved engineering practices can cut your operating costs . . . conserve manpower for more exacting jobs. Our foundry specialists will pool their experience and judgment with yours and your consultants' to provide smooth coordination between operations . . . boost production in present floor space. And it all begins with a call to your nearby Link-Belt office.

13,854

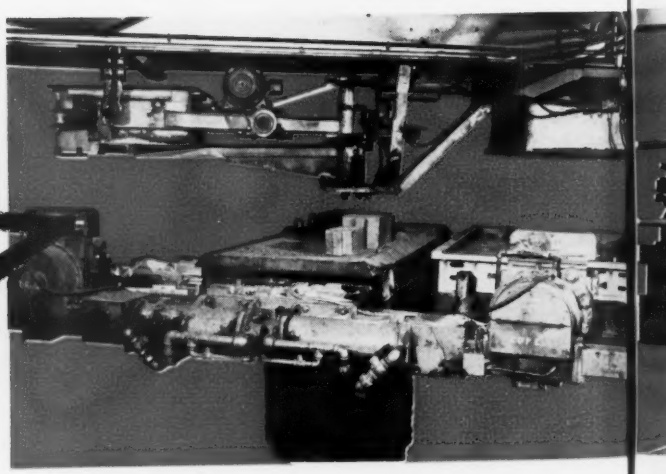
LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

THE HERMAN INDEXING MACHINE

For automatic high-speed molding



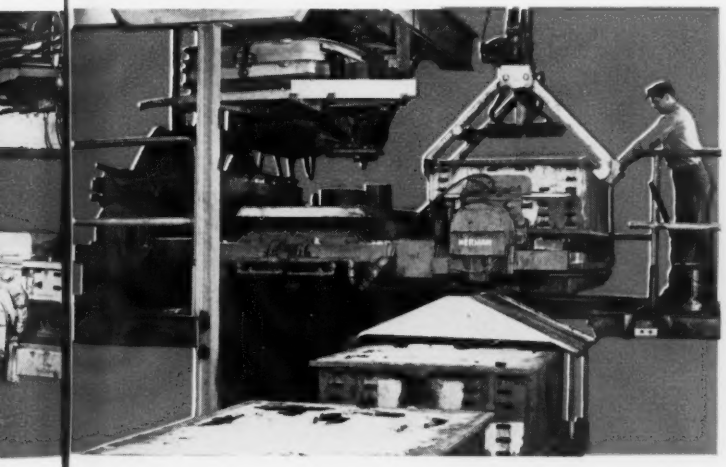
The Herman Indexing Machine is our answer to the need for automatic control of molding operations. It operates on a timed-sequence automatic cycle which can be interrupted, if necessary, at the central panel control board.

Increased rate of production, uniformity of molds and improved operating conditions are just a few of its many advantages. Safety devices assure the best possible working conditions.

Here you see the Herman Indexing Machine being used in the production of molds for freight car couplers and other railroad castings.

Let us show you how the Herman Indexing Machine can improve your particular molding operation. Call the Herman sales engineer in your area.

Our catalog No. GC-11-53 will give you complete details on our complete line of Herman molding machines, in all types and sizes, to fit every foundry operation.



HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

HERMAN

Best Known Name in Molding Machines

Only COLEMAN TOWER® OVENS
provide all these major advantages

INCREASE PRODUCTIVITY

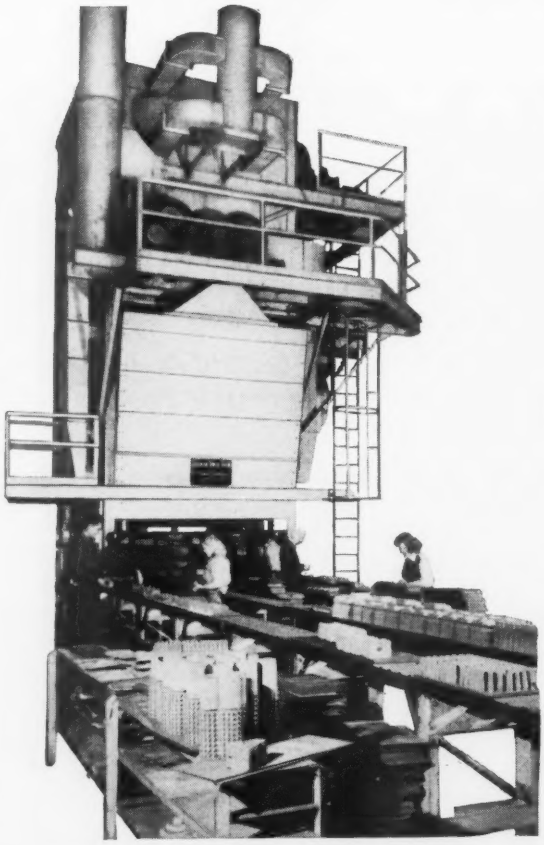
Savings through consistent, dependable production of perfectly baked cores; eliminating rejects, makeovers and casting losses due to improper core baking.

SAVE SPACE

Vertical design permits saving of approximately 75% of floor space over batch ovens of the same capacity. Cores are "smoked-off" and cooled before leaving unloading station.

REDUCE MAINTENANCE

Heavy duty construction for continuous, dependable performance and economical operation reduces maintenance cost to a minimum.



Coleman Tower ovens use only 25% of floor space required by batch type ovens of same capacity.

SAVE TIME

Cores of widely different sizes and shapes can be handled at the same time, all baked with consistent uniformity. Trucks, racks and money-wasting handling methods are eliminated.

SAVE BINDER

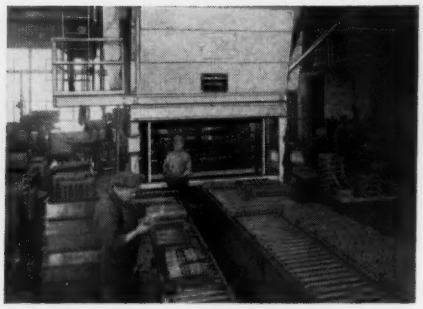
Proper core baking atmosphere and uniform temperature provide sizeable savings in conventional or high speed binders.

SAVE FUEL

The recovered heat is used over again, thus yielding important fuel saving. The most economical fuel available to you can be conveniently used.

Patented Open Center permits close, efficient grouping of coremakers around the oven... results in increased coremaker productivity.

3-way loading feature increases accessibility 300% over ordinary vertical oven designs.



Recuperative cooling system "smokes-off" and cools the cores before they reach unload station.

Coleman Tower Ovens are the most widely used continuous core baking ovens in the foundry industry. They have brought the advantages of mechanization to large and small foundries and have made important cost reductions. Why not find out whether Coleman Tower Ovens can bring the same savings to you? Our engineers are available without obligation to make practical recommendations for your particular requirements...call or write today!

WRITE FOR BULLETIN 54

A COMPLETE RANGE OF TYPES AND SIZES

for every core baking and mold drying requirement:

Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
Dielectric Core Ovens

THE FOUNDRY EQUIPMENT COMPANY
1821 COLUMBUS ROAD CLEVELAND 13, OHIO

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

MONSANTO PROFIT PICTURES

Foundry eliminates costly finishing with **Resinox***-bonded shell molds

Outstanding strength of Resinox-bonded shell molds, with cope and drag sections cemented together, permits horizontal pouring without back-up or support of any kind.

MONSANTO PHENOLIC RESIN IS LOWERING COSTS FOR PRODUCTION PATTERN & FOUNDRY CO.

Years of experience and experimentation have proved to the Production Pattern & Foundry Co., Chicopee, Mass., that precision parts can be shell molded at less cost than is possible with mechanized green sand processes.

This fast-growing young foundry, specializing in components for automotive and mill machinery, is pouring an average of 50 tons of iron a day in shell molds bonded with Monsanto's Resinox 736.

"We are eliminating costly finishing steps with Resinox-bonded molds," says Earl W. Jahn, President, "and pouring twice as many castings in the same floor area."

Resinox 736 produces stronger molds that deliver castings with sharper detail and smoother finish, thus holding finish-grinding of precision parts to a minimum.

Because the economy and quality of shell molding depends so much on the resin used, it will pay *you* to specify Resinox 736.

For a complete line of shell molding, core binding and sand conditioning resins that are research-developed and shop-tested to meet all your foundry needs, write to Monsanto Chemical Company, Plastics Division, Dept. FO-12, Springfield 2, Massachusetts.

MONSANTO®

*RESINOX REG. U.S. PAT. OFF.

5 big "TOUCH of GOLD" advantages of

NORTON K BOND† WHEELS

for your slow speed snagging of gray or malleable iron or non-ferrous metals

1. Faster, freer cutting action 2. Much longer wheel life
3. Less frequent dressing 4. Corners held better 5. Consistent duplication

You can count on Norton K Bond wheels to deliver every one of these money-saving benefits on every slow speed snagging job in your cleaning room—on gray or malleable iron or on non-ferrous metals.

That's because the K Bond is the most radically improved vitrified bond ever developed for these applications. As a result, Norton CRYSTOLON* wheels bonded with it are consistently outperforming and outlasting other wheels.

This has been proved in foundries through the country — on equipment ranging from light portable grinders to heavy swing frames and including floor and bench stands. Here are some typical reports, telling how Norton K Bond wheels add the "Touch of Gold" that cuts cleaning room costs:

- *"K Bond wheels increased wheel-life from 80 to 120 hours. Also reduced operator fatigue."*
- *"Best and fastest cutting wheels ever used."*
- *"We ground an average of 11,000 more piston rings with K Bond wheels than any wheel formerly used."*
- *"Excellent performers. Faster cutting and lasted a week longer than other wheels."*
- *"K Bond wheels lasting 20% longer. Best wheels in our experience.'*

Test Them In Your Own Foundry

Your Norton Distributor will be glad to arrange a test of K Bond CRYSTOLON wheels in your own plant. Take advantage of this opportunity — get proof of how these revolutionary wheels will grind off more metal per dollar on your slow speed snagging jobs. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

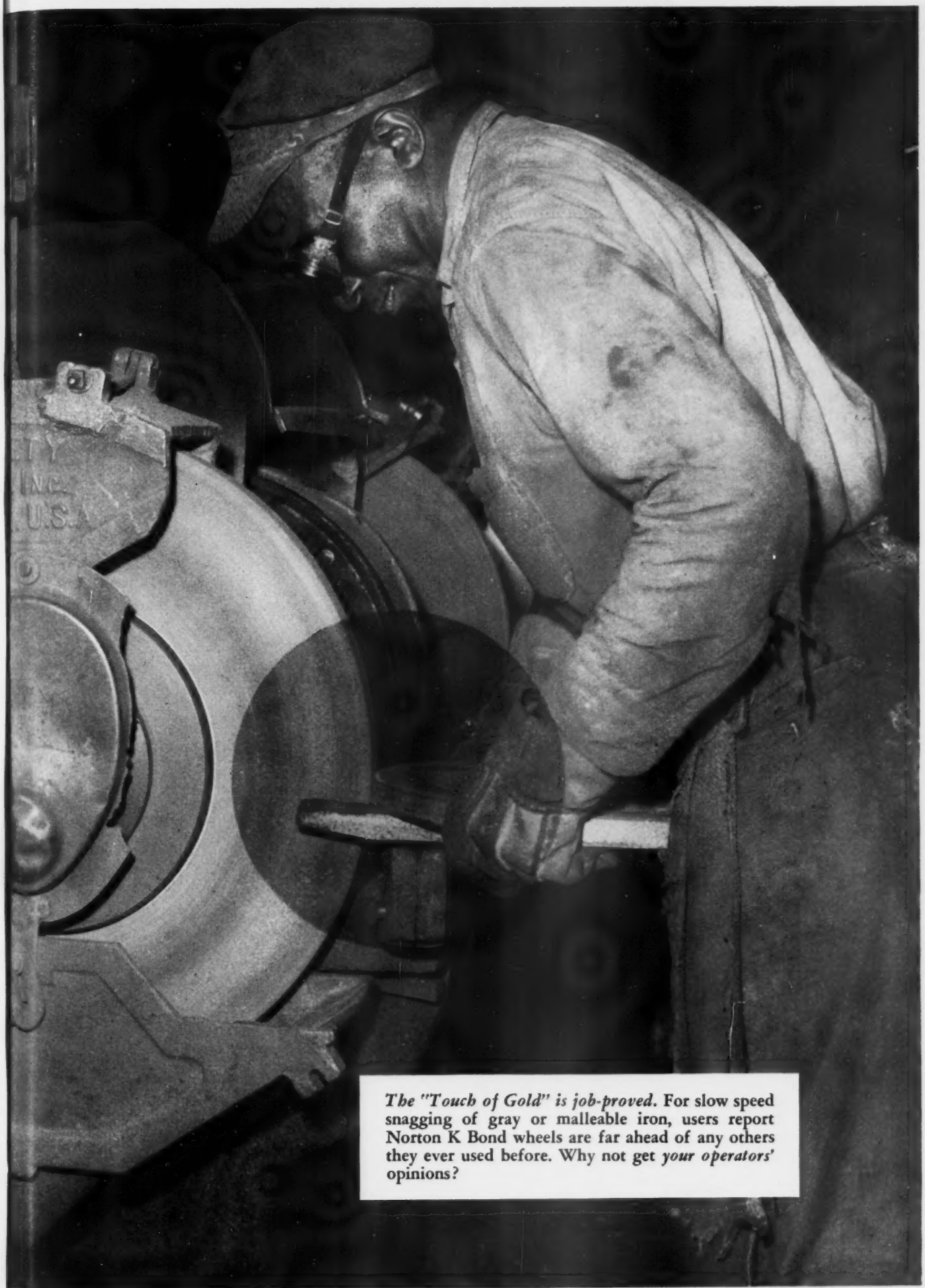
Making better products... to make your products better

NORTON

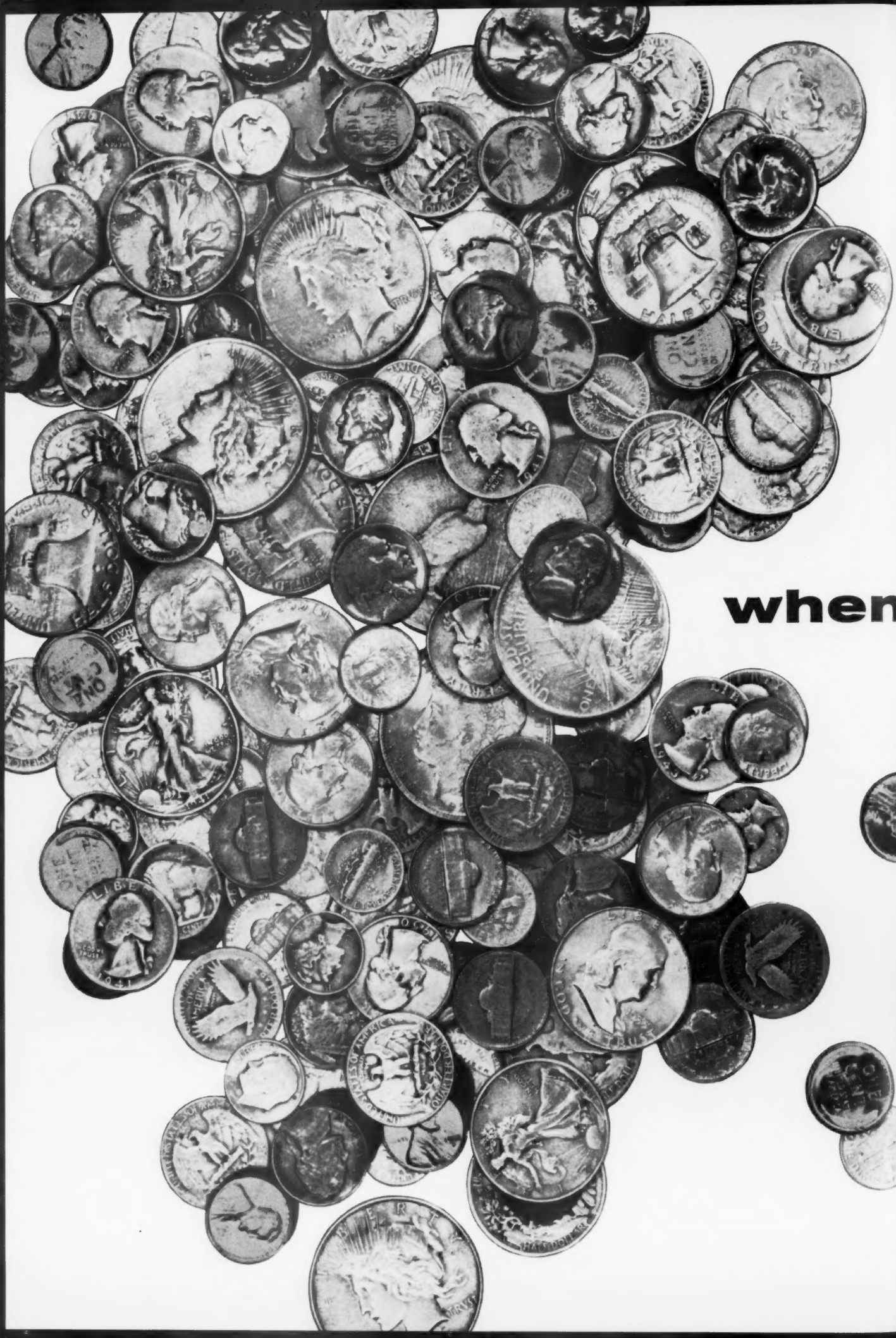
and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

† Patent applied for * Reg. U. S. Pat. Off. and Foreign Countries



The "Touch of Gold" is job-proved. **For slow speed snagging of gray or malleable iron, users report Norton K Bond wheels are far ahead of any others they ever used before. Why not get *your operators'* opinions?**


when it

We call the machine *SPOMATIC.* Users call it *The Money Maker.*

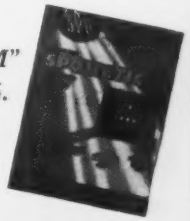
It doesn't actually mint coins . . . it just makes more uniform-standard molds per hour than any other molding machine in the world.

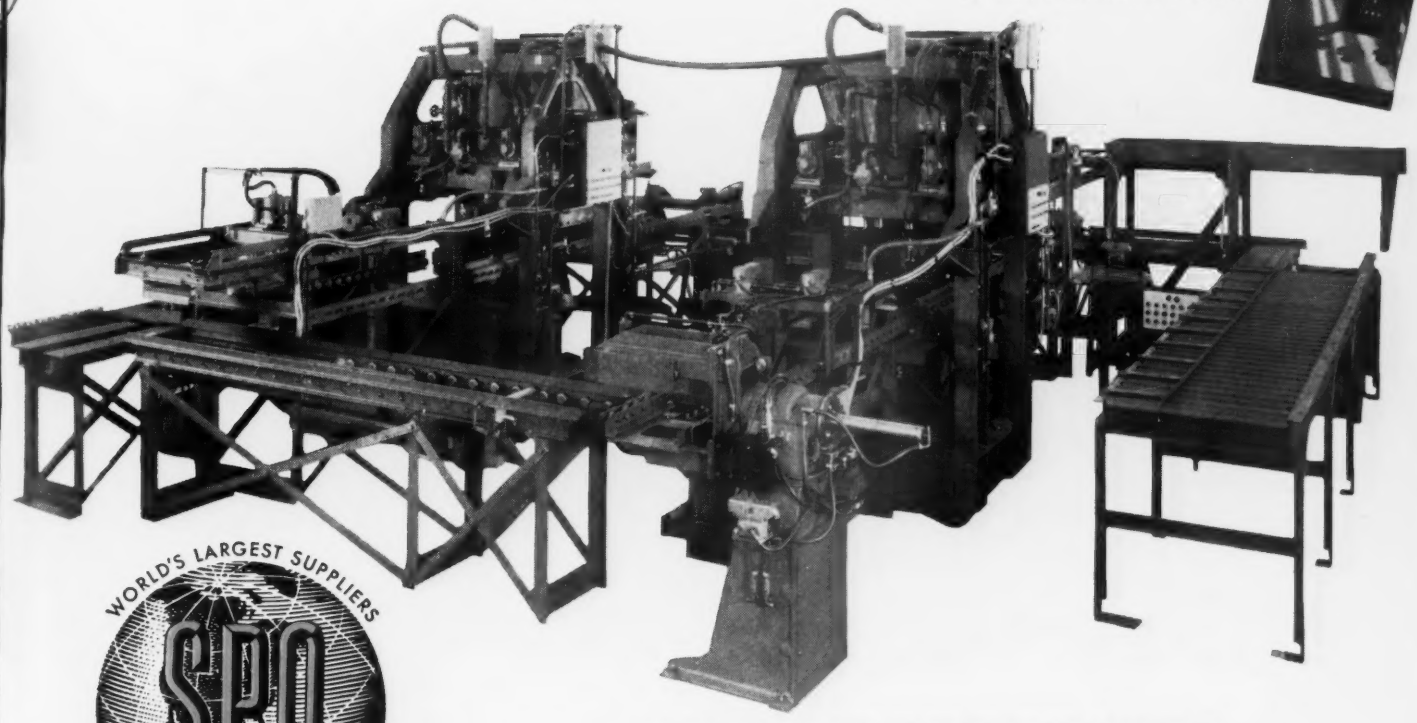
That's why SPOMATIC is changing the profit picture in foundries. As the first successful fully-automatic molding machine, it takes the time, guesswork and variables out of mold production. Designed to operate with minimum supervision and maintenance, SPOMATIC brings automation . . . and a tremendous new competitive advantage . . . to mass-production foundries of all types.

Whether you are renovating existing facilities or planning a new installation, be sure to check the advantages a SPOMATIC will give you. Once you've seen it operate, or even studied "before" and "after" statistics, you will know why we say . . .

it's dollars and SENSE...
it's SPOMATIC!

For additional details, write for BULLETIN "MM" or call DIamond 1-3666.





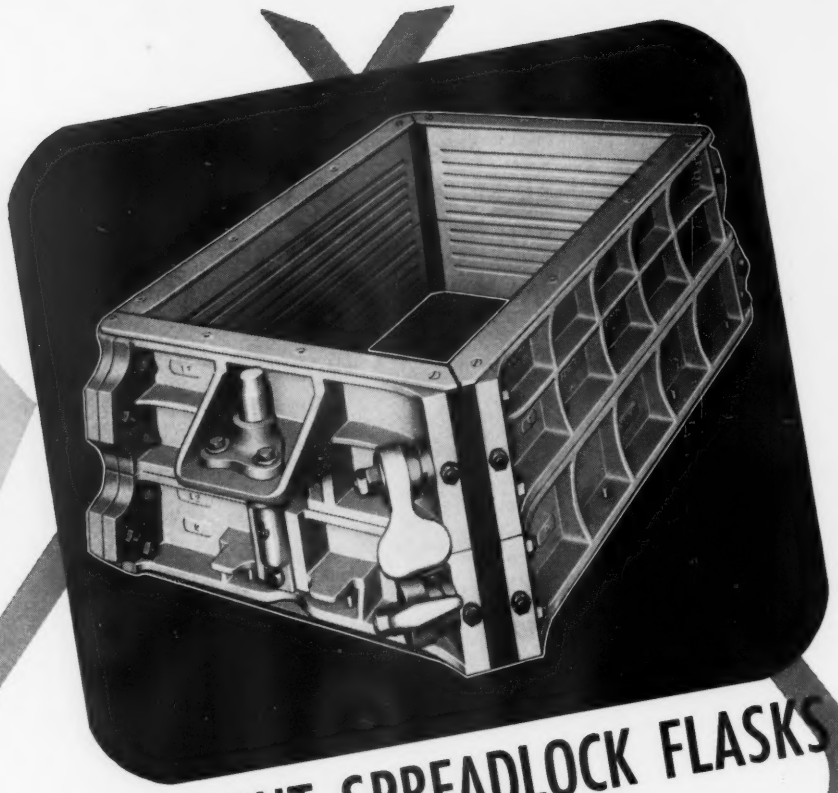
WORLD'S LARGEST SUPPLIERS OF MOLDING MACHINES

SPO INCORPORATED

6449 GRAND DIVISION AVENUE • CLEVELAND 25, OHIO

SAND-FREE CORNERS

Corner gaps completely closed by long-life, replaceable live rubber inserts.



FREMONT SPREADLOCK FLASKS

PERFECT ALIGNMENT

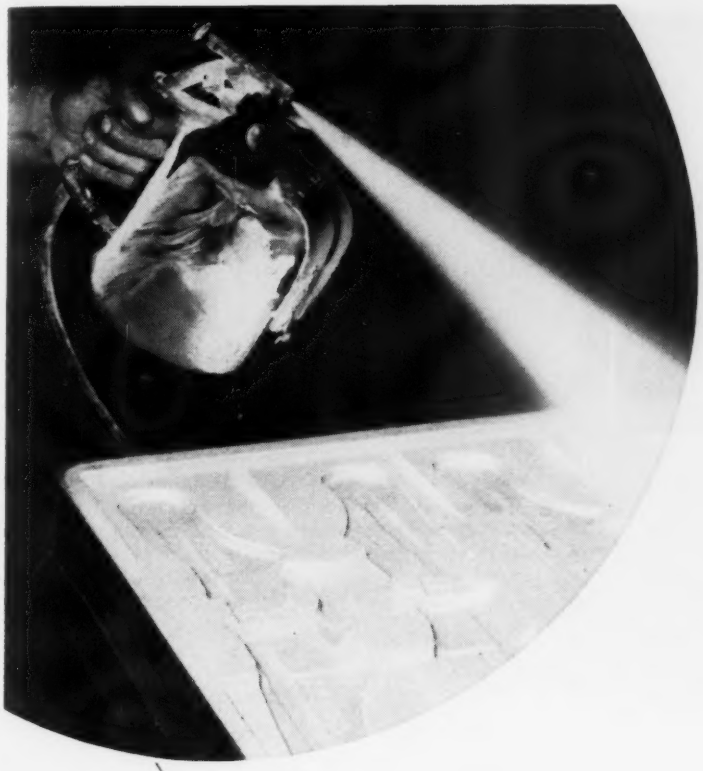
guaranteed by one foolproof GROOVLOCK pin. Solid, bolted and welded corners.

FREMONT STANDARD SLIP FLASKS

Write today for free literature and prices.
All orders given prompt attention.

THE FREMONT FLASK COMPANY • FREMONT, OHIO

LIGHTER, STURDIER MAGNESIUM FLASKS • CAST IRON AND ALUMINUM JACKETS



TOP BOND

The secret of a fine clean casting lies at the mold surface. Tying down surface sand can be important and United has found a way to do just that.

Every foundry is proud of the castings it turns out and every foundry researcher has his ear to the ground for new improvements, so this message is for him.

A conditioning agent for cores and molds that builds up surface hardness and ties down surface sand is available as an air drying spray—it's Top-bond.

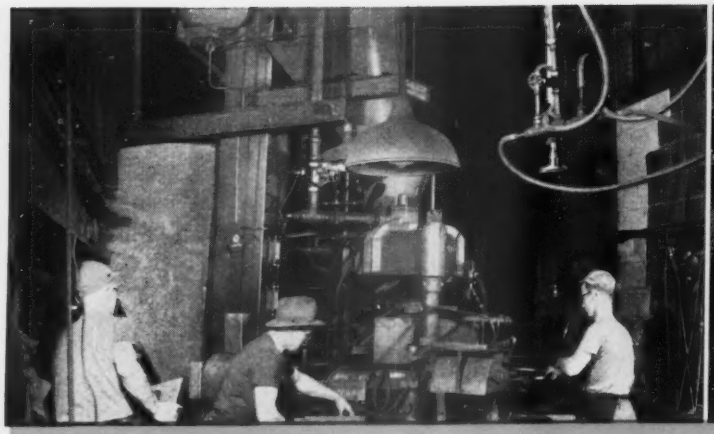
Suppose you are having sand pick-up at gates and sprues, spraying with Top-bond at these points will prevent sand inclusions in your castings. Are you interested in cleaner castings at the shakeout? Top-bond sprayed on a well made mold surface will show visibly better results. Sometimes cores are inadvertently overbaked and come from the oven too badly burned to use. Most generally these cores can be saved and used if they are sprayed with Top-bond and allowed to dry. Have you been using baked molds for special jobs? A green mold sprayed with Top-bond can produce just the hardness you may need to match baked mold performance, and green sand cores that are Top-bond sprayed will come through with the hardness of a baked core.

These are just a few of the traits that will recommend Top-bond for your daily use. The whole story with facts, figures, and sand mixes will be mailed to you if you write us. One foundry gives their own experience and mentions valuable savings that resulted when Top-bond was used in their regular work.

Write for factual bulletin describing foundry experience with TOP-BOND.

UNITED OIL MFG. COMPANY

1429 WALNUT STREET, ERIE, PA.



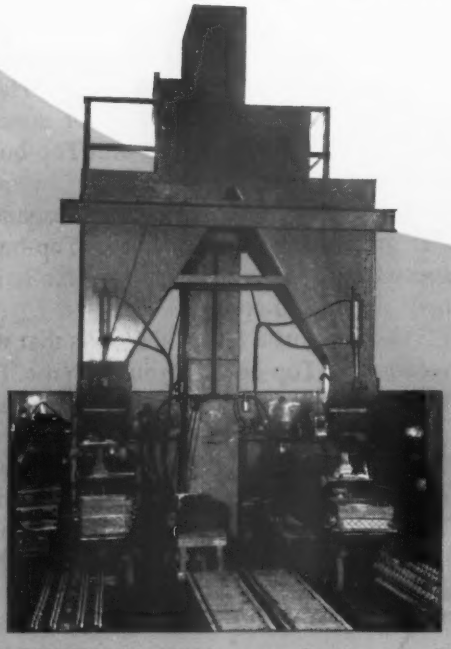
LAKEY FOUNDRY AND MACHINE CO., Muskegon, Mich., is using standard Handy Sandys in conjunction with Rotary Core Blowers to help jump production of cores from 350 to 2500 daily. Production per man has more than doubled since the Newaygo units were installed. To meet the space problem in the core room, Newaygo developed special storage hoppers, wing boards and special feed hoppers.

Each Handy Sandy is capable of feeding over 8 tons of core sand per hour to each core blowing unit. The cores average from 14 to 50 lbs. each.

GENERAL ELECTRIC COMPANY'S Malleable Iron Foundry in Erie, Pa., is using two Twin Hopper Handy Sandys to replace six floor molding units making malleable castings for locomotive and car equipment. The General Electric Company is very well pleased with the performance of this Newaygo Equipment and has reported maintenance costs to be extremely low.

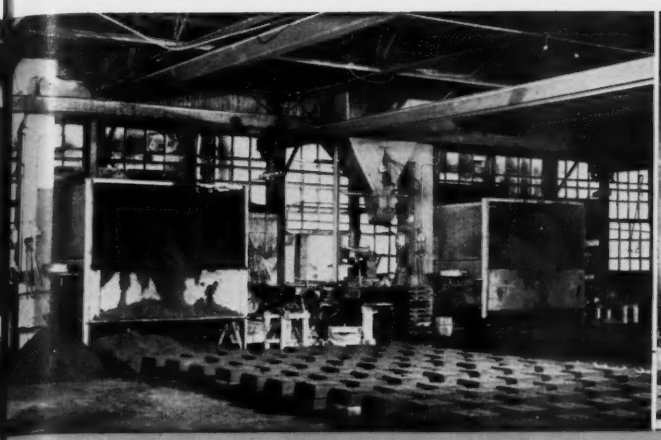
Foundry Business is BIG

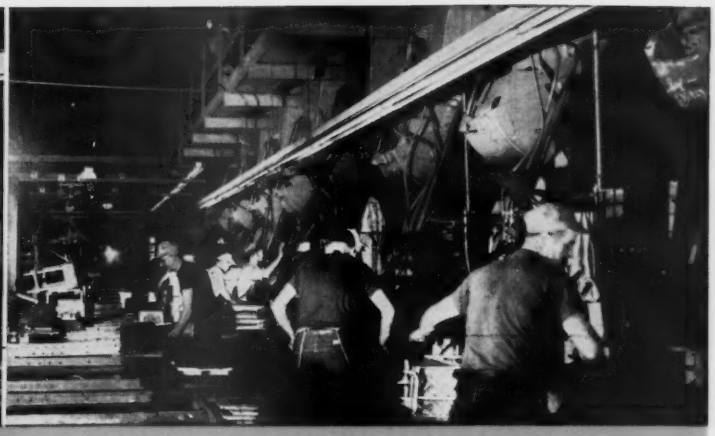
and profitable with NEWAYGO *mold and conditioning*



SUPER HANDY SANDY in a prominent eastern foundry has shown tremendous savings. In one installation this low-cost individual floor sand handling unit increased mold production on large molds 150% due to savings in shovel time alone. Super Handy Sandys are available with single or double hoppers for supplying one or two molding stations and can handle up to 50 tons of sand per hour.

PACIFIC STEEL CASTINGS COMPANY, Berkeley, Cal., is another example of a Newaygo installed Sand Handling system. "The excellent cooperation which we received from the planning stage to the completion of the installation is a real service to any company which is considering the installation of a sand handling system," states Mr. J. D. Genger, Vice President in charge of operations at this foundry.





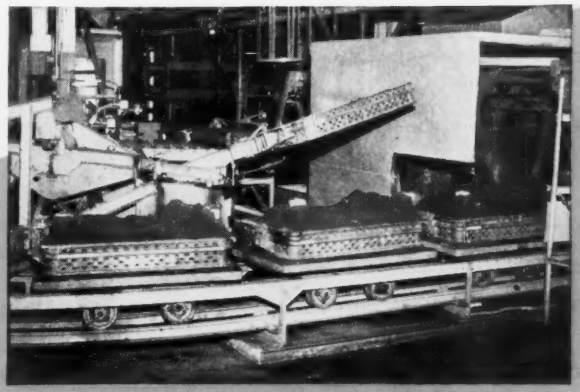
Mr. Lou Keen, President of KEEN FOUNDRY CO., Griffith, Indiana, states: "We've invested in 10 Newaygo Handy Sandys in less than 3 years for several reasons. First, these individual Sand Handling Units are very adaptable to the physical characteristics of our foundry. Second, their great flexibility gives us overhead sand stations at any point in the foundry without costly remodeling. Third, Handy Sandys require low capital investment."

AUBURN FOUNDRY, INC., Auburn, Indiana, "When our foundry 'threw out the shovel' in favor of mechanization, we picked Newaygo to work with us because of their experience in engineering and fabricating sand handling systems. With the 120 ton Sand System, increases in casting production, improved pouroff and sand handling have been very evident."

Business...

handling, sandhandling equipment

UNITED STATES FOUNDRY CORPORATION, Milwaukee, Wis. "Newaygo Handy Sandys and Reddy Sandys combine their automatic features to eliminate all shoveling from the shakeout, sand preparation and molding cycle. Their installation has made a vast improvement in working conditions and has increased over-all production 35%."



CENTRAL SPECIALTY DIVISION, Ypsilanti, Michigan, "This is the fifth sand handling system Newaygo has installed for us. On this particular job we wanted engineering ability, heavy duty specifications plus follow-through and attention to job details. Newaygo filled these requirements. This extremely compact automatic molding system is contained in an area 165' by 50' and is shaping up very successfully."

View from the pouring floor of a large midwest steel foundry showing specially designed molding hoppers of Stainclad Steel with air operated gates. Also shown is the mold storage end of the Platen Car set-out track system. Molds are handled on pallet cars and are automatically dumped at end of lines into a vibrating pan conveyor. Pallet Cars and boards are automatically returned on an underneath track system.

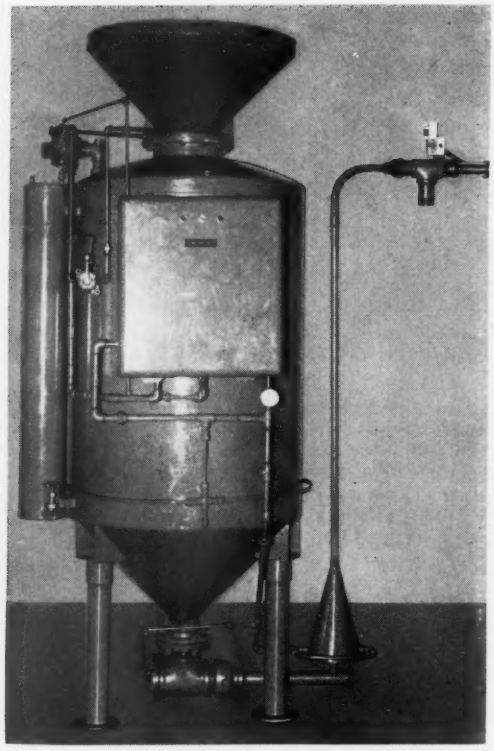
A Copy of "Planned Mechanization for Foundries" is yours for the asking. Write, wire or phone today.

NEWAYGO engineering company
NEWAYGO, MICHIGAN

Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment

Another First!

HARTLEY BOND FEEDER



A NEW and REVOLUTIONARY DEVELOPMENT FOR SAND SYSTEMS . . . . NOT ONLY TRANSPORTS . . . . IT MEASURES DRY MATERIAL!

- A storage hopper large enough to store a days supply of any dry material is located conveniently at ground level.
- The material is transported to the mixer where it is accurately measured in individual batches as required.
- Batches of delivered material can be varied by a simple setting of the control.
- Available also for multiple mixing units operating from the same storage hopper. The quantity delivered to each mixer is accurately measured independently of other units.
- Low initial cost—Saves space—Dependable—Rugged—Flexible —*Accurate.*

HAYLCO CONTROLS *Corporation* Neenah, Wisconsin

The Original Manufacturer of Automatic Controls For Sand Systems

Specialty Safety Products

When Power Fails... Maintain Production and Safety with *Instant* AUTOMATIC AO† SENTRY-LITE!

SENTRY-LITE MODEL 200X

Illuminates approximately 10,000 sq. ft. for 12 hours or longer. Shuts off automatically when power resumes. Recharges battery automatically when power is restored. Portable — excellent as auxiliary light. Also available with single head (not shown) which illuminates approximately 5,000 sq. ft. for 15 hours or longer. 24 month guarantee on battery. Battery requires water only once a year.

750
LENS CLEANING CABINET

Makes lens cleaning easy — provides all necessary cleansing and anti-fog materials in one handy, on-the-wall unit — 12″ long, 9″ high, 6″ deep of selected hardwood. 750F Lens Cleaner: Consists of 6 oz. bottle 750B and sprayer 750S. Order fluid separately.

750T Cleansing Tissue: 240 sheets supplied. Openings in front of cabinet make it easy to detach single sheets.

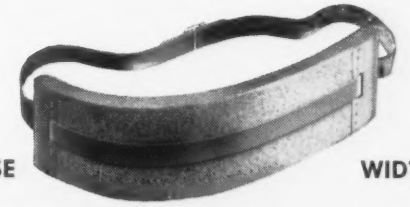
Tissue Disposal: Openings at top of cabinet permit easy, neat disposal.

111 Anti-Fog: One 1-oz. jar supplied with cabinet.

MUFFLES HARMFUL PLANT NOISE

A new addition to AO's full line of Sound Protectors. Accommodates larger ears, cuts out harmful noise. Headband is rugged, adjustable, padded. All connections insulated. Oval shaped ear cups fit snugly, stay comfortably in place, seal opening at jawbone section. Available with built-in earphones.

1245B-3
STRAIGHTAWAY
SOUND PROTECTOR



109B CELLULOSE SWEATBAND **WIDTH 1¾″**

AO SWEATBANDS Keep Production Up — Accidents Down!

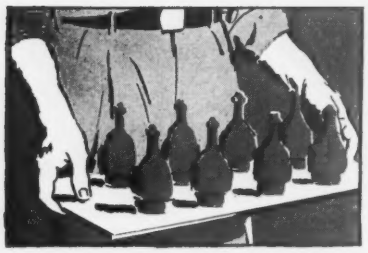
The sweatband shown is designed for heavy exposures to heat and humidity. Absorbs 16-20 times its weight. Reinforced at ends. Can be cleaned with soap and water and used over and over. Will stand up under washing and sterilizing and give long service. For maximum absorbency and comfort dip in water and squeeze out before use.

American Optical
SAFETY PRODUCTS DIVISION

Your nearest AO Safety Products Representative can supply you

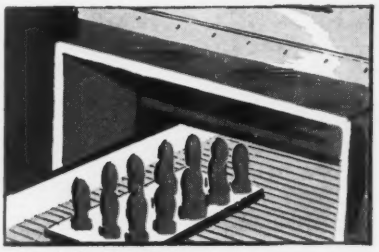
†T.M. Reg. by American Optical Company

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES



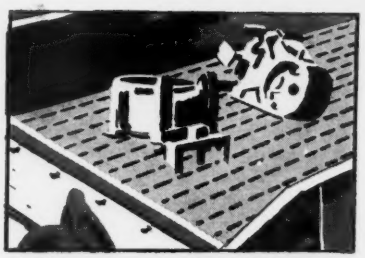
Superior Green Strength

Mogul imparts sag resistance and dimensional stability throughout handling and storage.



Quick Drying

All of our cereal binders and dextrines have this property, enabling you to increase oven capacity.



Adequate Collapsibility

These binders burn out at the desired moment, producing uniformly smooth draws.

A cereal binder for every bonding need

A complete line of foundry binders from the world's prime producer of corn products

THESE CEREAL BINDERS ARE PREFERRED FOR THEIR

- **CONSTANT AVAILABILITY**
- **SUPERIOR UNIFORMITY**
- **BROAD ADAPTABILITY**

Why you get greater green strength with MOGUL® Cereal Binder

Specially developed to meet today's needs for greater efficiency, Mogul Corn Cereal Binder is unique in the industry. Carefully controlled modern wet-milling processes produce a uniform product. Because of its bonding power in the wet state, Mogul Binder produces a core of great sag resistance and dimensional stability. Cores made with Mogul Binder produce castings with finer finish and exceedingly true pattern reproduction.

Why you get greater dry bond with KORDEK®

Kordek Core Binder renders complete binder coverage for foundry purposes. Kordek Core Binder develops a superior dry bond. Kordek is highly soluble, does not absorb core oil, and burns out completely, producing smooth draws. Kordek, a uniform product, is readily available in quantities to suit your needs.

Ask our technical service people how these superior cereal binders can help solve your casting problems. A special new foundry laboratory is ready to serve you. There is no charge or obligation for this service.

Why GLOBE® Dextrines regulate core hardness

The variety of solubilities available in Globe Dextrines enables you to achieve the degree of surface hardness you require. The controlled migrating properties of Globe Dextrines assures you of a smooth, hard surface when you want it and complete burn-out at the proper moment. Globe Brand Dextrines enable you to achieve exactly the collapse rate you desire, thus assuring you clean castings with close tolerances and a minimum of scrap.

GLOBE

CORN PRODUCTS REFINING COMPANY • 17 BATTERY PLACE, NEW YORK 4, N. Y.

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ELECTRIC MELTING FURNACES

TOPS FOR PRODUCTION OF HIGH GRADE STAINLESS, ALLOY AND RIMMING STEELS

The Ideal Furnace for Foundries

THE HEROULT IS THE SAFEST, most dependable electric furnace on the market. Available in foundry sizes with either Gantry or swing-type roof, the Heroult is equipped with the latest time- and labor-saving mechanical devices and electrical controls. It is noted for its efficient performance, simplified operation, and low operating and maintenance costs.

We welcome an opportunity to help you select and install the electric foundry furnace best suited to your particular requirements.

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Here's a comprehensive discussion of the modern electric furnace you will surely want to keep for frequent reference. Contains up-to-date information on Heroult Electric Furnaces—types, sizes, capacities, ratings, etc. Write Pittsburgh Office for free copy.

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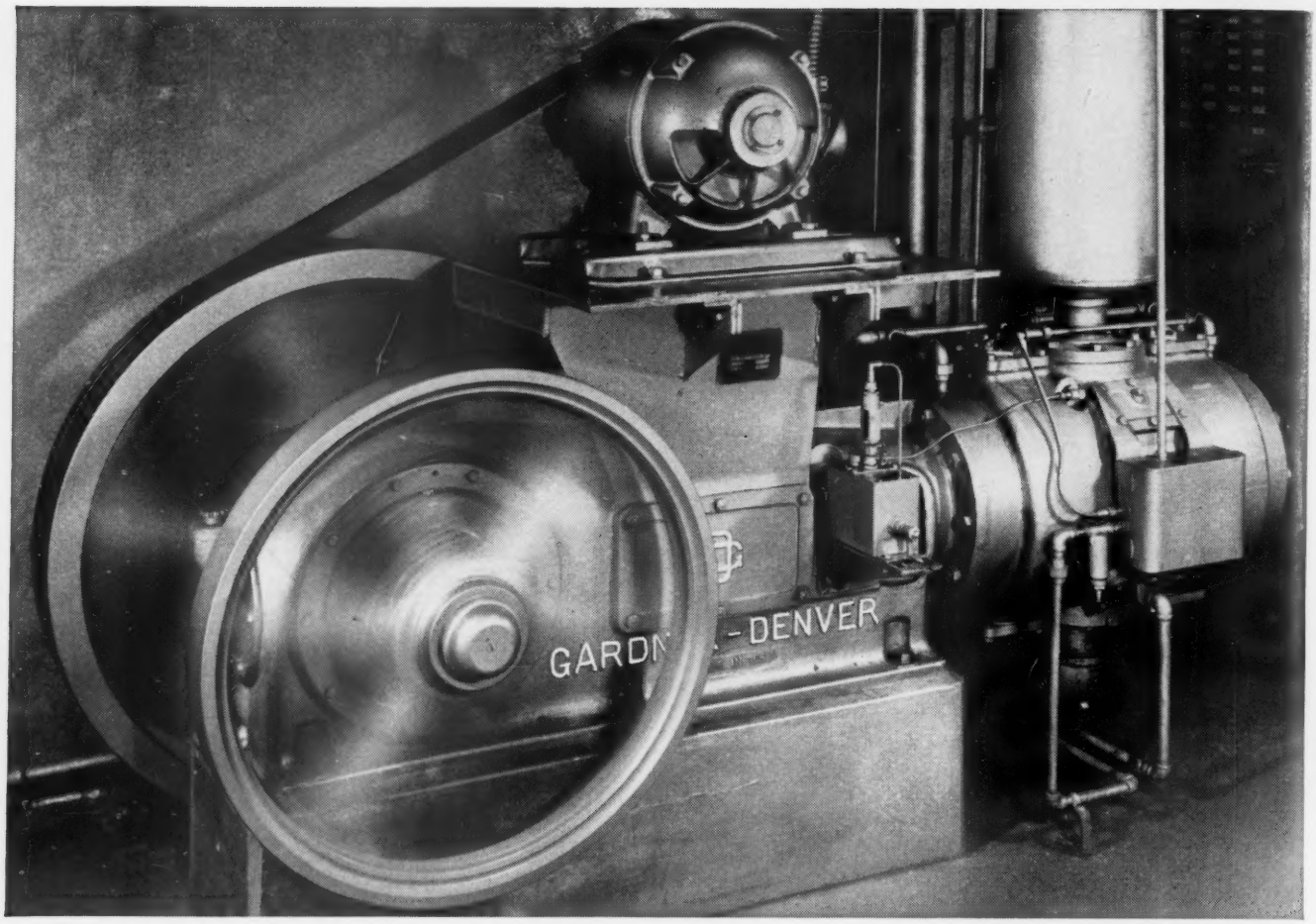
AMERICAN BRIDGE

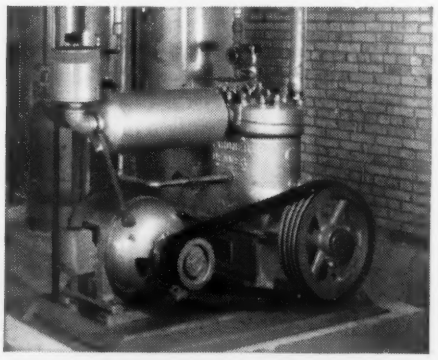
UNITED STATES STEEL



Model RX — 89 to 1292 c.f.m. Bulletin HAC-40.

MORE GARDNER-DENVER HELP FOR YOU IN THIS AGE OF AIR POWER

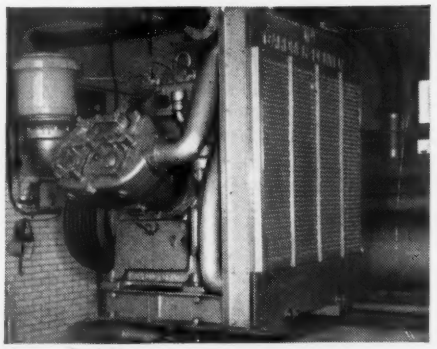
Model AA — 32 to 183.6 c.f.m. Bulletin AA-6.



GARDNER-DENVER Since 1859 KELLER TOOLS

* Expert help in choosing the right size and type air compressor for your plant.
* Pointers on compressor care and maintenance to help you obtain the full efficiency of Gardner-Denver quality.
* Application suggestions for utilizing low-cost air power from Gardner-Denver compressors.

Model WB-142 to 686 c.f.m Bulletin WB-10.



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THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

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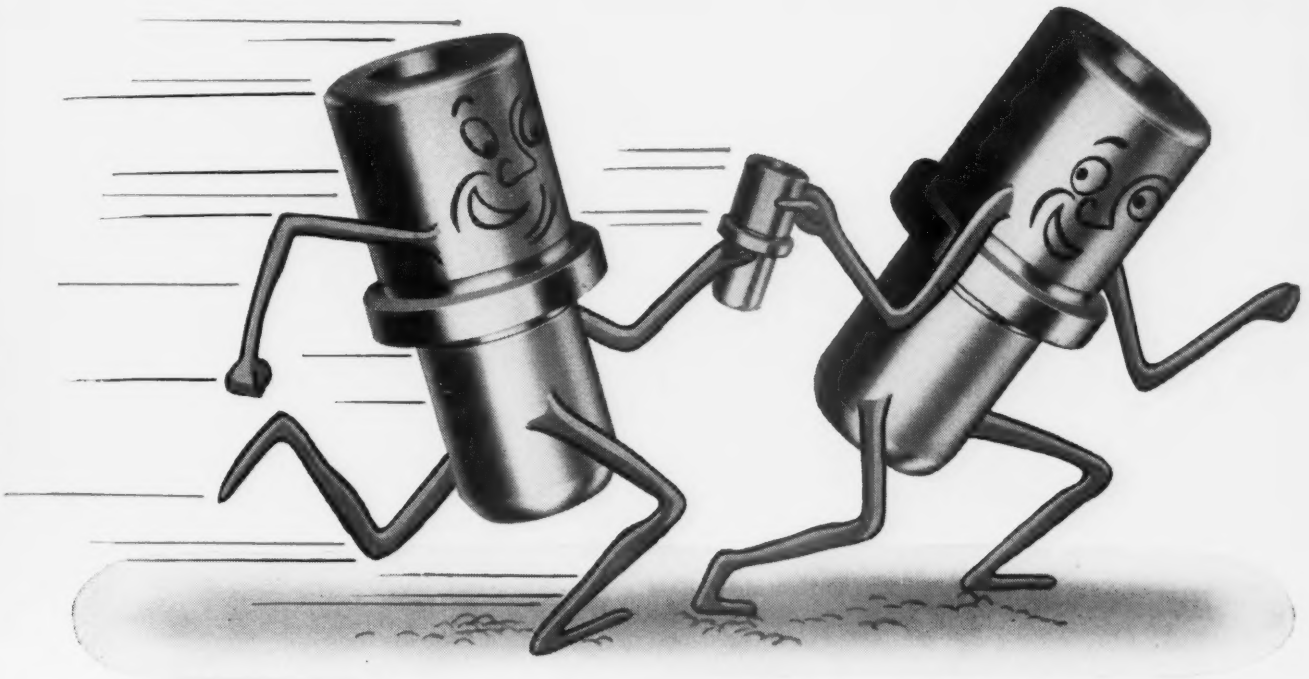
QUICK CHANGE WITH UNIVERSAL STANDARD PRESS-FIT FLASK PINS AND BUSHINGS



To compensate for wear in the ear holes of cope and drag, standard size Universal Press-Fit Flask Pins and Bushings are available with three different outside diameters, the second slightly larger than the original size and the third slightly larger than the second. Thus, as the ear holes increase in size—and replacement of the original pins and bushings becomes necessary—pins and bushings with a larger outside diameter are available to provide a good, tight fit in the larger ear holes without welding or other expensive, time-consuming operations. Just drive out the old, press in the new . . . truly "quick change"!

Universal Flask Pins and Bushings of all types are available in a complete range of sizes as regular stock items. Plain, taper, threaded or hexagonal series. For complete information, write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

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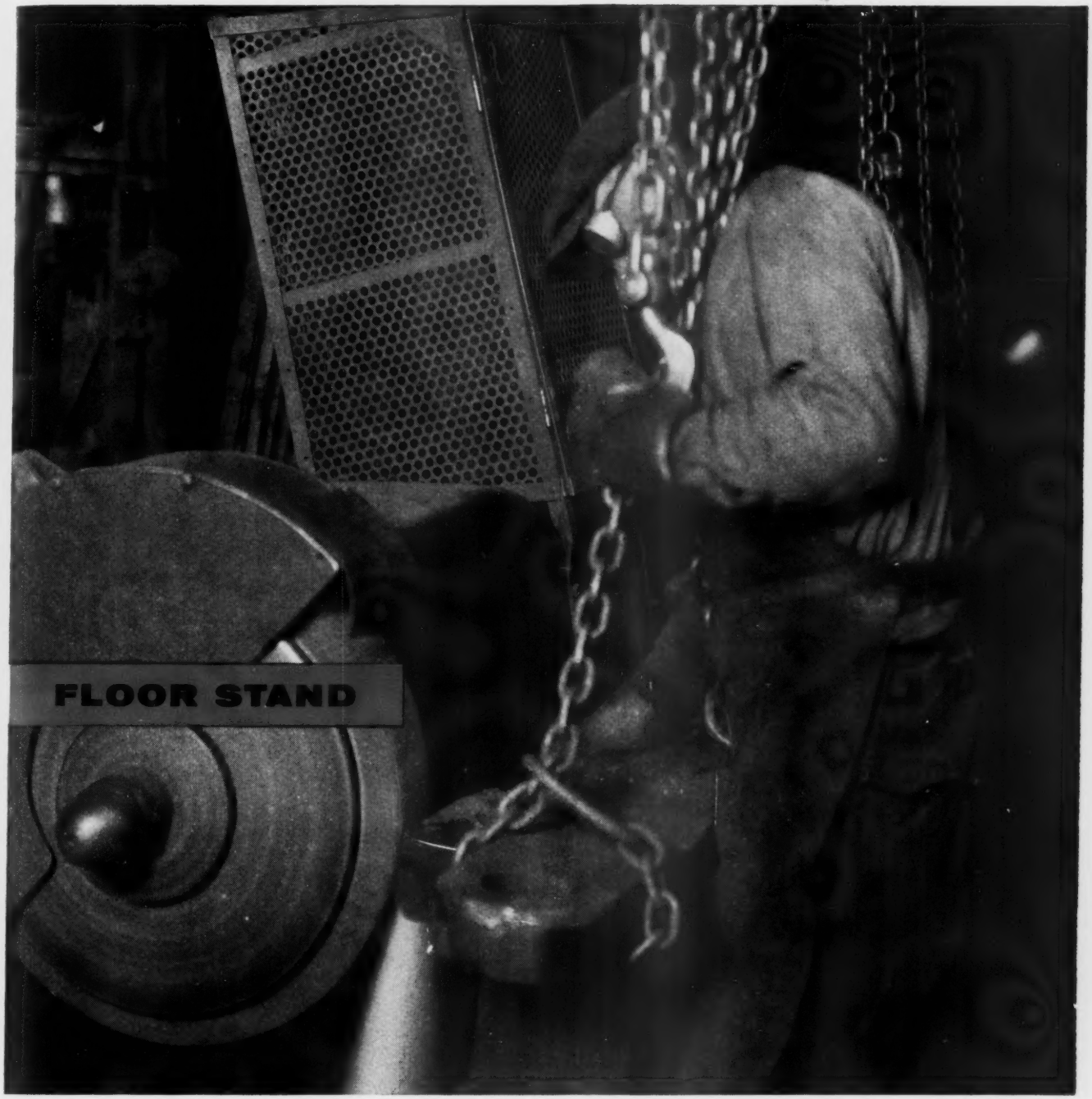
UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 4, MICHIGAN

Remove metal **FASTER...**

YOUR CARBORUNDUM DISTRIBUTOR or salesman offers expert help in selecting the wheels best suited to your operations. He's completely stocked to give you fast, efficient service. Call him today—listed in the yellow pages of your phone book under "Abrasives" or "Grinding Wheels."

FREE BOOKLET! "Abrasive Products for the Foundry" gives recommended wheel gradings for various materials, plus detailed information on the complete line of cost-cutting abrasive products by CARBORUNDUM for foundry use. Write The Carborundum Company, Dept. F 81-510, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.



on every **SNAGGING** *operation*

CARBORUNDUM'S B5 RESINOID BOND SNAGGING WHEELS, in both aluminum oxide and silicon carbide, combine uniformly *higher* rate of cut with *longer* life...which means substantial savings in any foundry.

Operators find that snagging wheels by CARBORUNDUM resist loading and are easier to use, with far less physical effort. In addition, the new type bonds incorporate exceptional strength. Wheels hold shape longer, resist mechanical shock as well as heat shock, and give maximum safety under the most severe grinding operations.

FOR EVERY ABRASIVE JOB in your foundry...on castings, forgings, welds...on high and low tensile steels...on non-ferrous metals...and on every type of machine...the proper snagging wheels by CARBORUNDUM can increase your production and cut your costs.

CARBORUNDUM

REGISTERED TRADE MARK

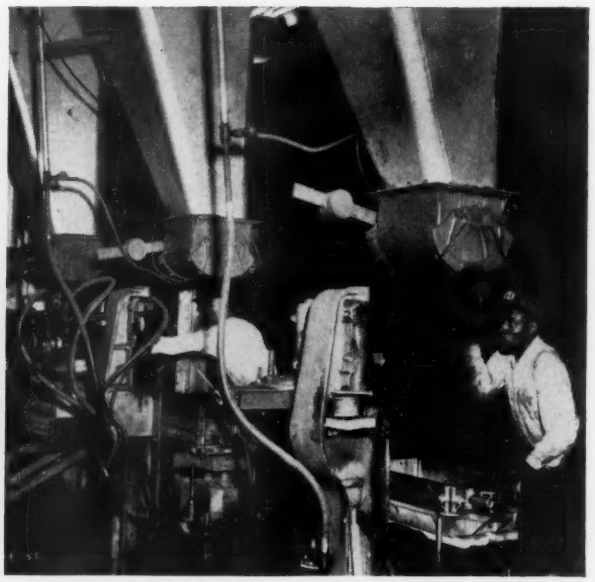
...continually putting more **SENSE** *in your abrasive* **DOLLAR**

81-510

JEFFREY MECHANIZATION cuts costs for handling and conditioning sand

at Forest City Foundries Company, Cleveland, Ohio

V-plows on overhead Jeffrey distributing belt conveyors, for diverting sand to molders' hoppers, are automatically air-operated. The two distributing conveyors and the cross conveyor move at 150 feet per minute; can handle 35 tons of sand per hour.



Ten Jeffrey hoppers along one side of the foundry, and nine along the other side, supply sand to the molders' stations. Hoppers are provided with 15" by 24" foundry-type clamshell valves.

Molds are poured on roller conveyors running between molding stations and shakeout conveyor. Poured molds are dumped onto this 65-foot Jeffrey vibrating conveyor, which shakes sand loose from the hot castings as they move along.

Castings and sand drop from this vibrating conveyor into the shakeout machine. Used sand is carried away by a Jeffrey apron conveyor, passed through cleaning and reconditioning equipment, after which it is elevated to storage by a Jeffrey bucket elevator. Now it's ready to start the circuit again.

Jeffrey can mechanize a complete foundry or a single operation. Write for Catalog 845. The Jeffrey Manufacturing Co., Columbus 16, Ohio.

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CONVEYING • PROCESSING • MINING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

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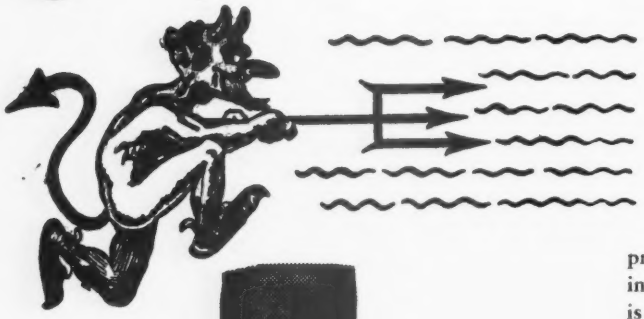
Soffel's



300 lb. aluminum bronze bearing cap cast with THERMOTOMIC feeding ring core under riser. Note small feeder opening which facilitates removal of riser from casting, resulting in greatly reduced cleaning costs.

THERMOTOMIC® COMPOUND and CARBON FREE LIQUIDIZERS

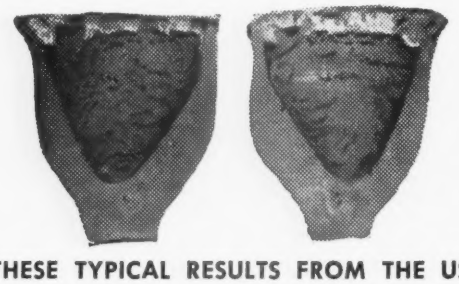
Keeps Metal Molten!

for Steel, Iron, Aluminum

Brass, Bronze, Copper

THERMOTOMIC "X" is a patented exothermic compound that produces a temperature over 3500° F. It can be molded or baked into any desired shape the same as sand cores. THERMOTOMIC "X" is used as knock off core rings with 1½ inch feeder opening under risers of feeding heads, also as insulating sleeves, inserts and facings, or mixed with facing sand where it is desired to maintain fluidity of the casting metal. Shorter and more compact heads and risers can be used. The small feeder opening permits easy removal of feeding heads and risers. In conjunction with THERMOTOMIC COMPOUNDS, we recommend the use of exothermic CARBON FREE LIQUIDIZER NO. 5 on top of the metal in the heads or risers as an insulating cover. For green sand casting molds, use THERMOTOMIC WP (Waterproof).

U. S. Patents No. 2,490,327 and No. 2,500,097



NOTE THESE TYPICAL RESULTS FROM THE USE OF SOFFEL'S *Carbon Free* LIQUIDIZER

With the application of 1 pound of SOFFEL'S CARBON FREE LIQUIDIZER, this 6″ x 6″ chrome-nickel-steel riser was reduced in weight from 32 pounds to 13 pounds average. A savings of 19 pounds of salable metal, normally discarded as scrap, was fed into the casting and produced a heavier, sounder casting. Note the feeding head can be knocked off easily, saving burning costs. There is no better feeding head compound at any price than SOFFEL'S CARBON FREE LIQUIDIZER.

THERMOTOMIC *Strainer Core* PRODUCES MONEL CASTINGS 270 LBS. SOLID

Made by direct pouring through the Thermotomic strainer core under the feeding head.

No chills were used, no shrinkage at the flange. Note depth of shrinkage in the feeding head.

BEWARE OF IMITATIONS! We are the originators of CARBON FREE LIQUIDIZER and THERMOTOMIC COMPOUNDS

PITTSBURGH METALS PURIFYING COMPANY

World's Largest Manufacturer of Fluxes and Purifiers For All Metals and Alloys

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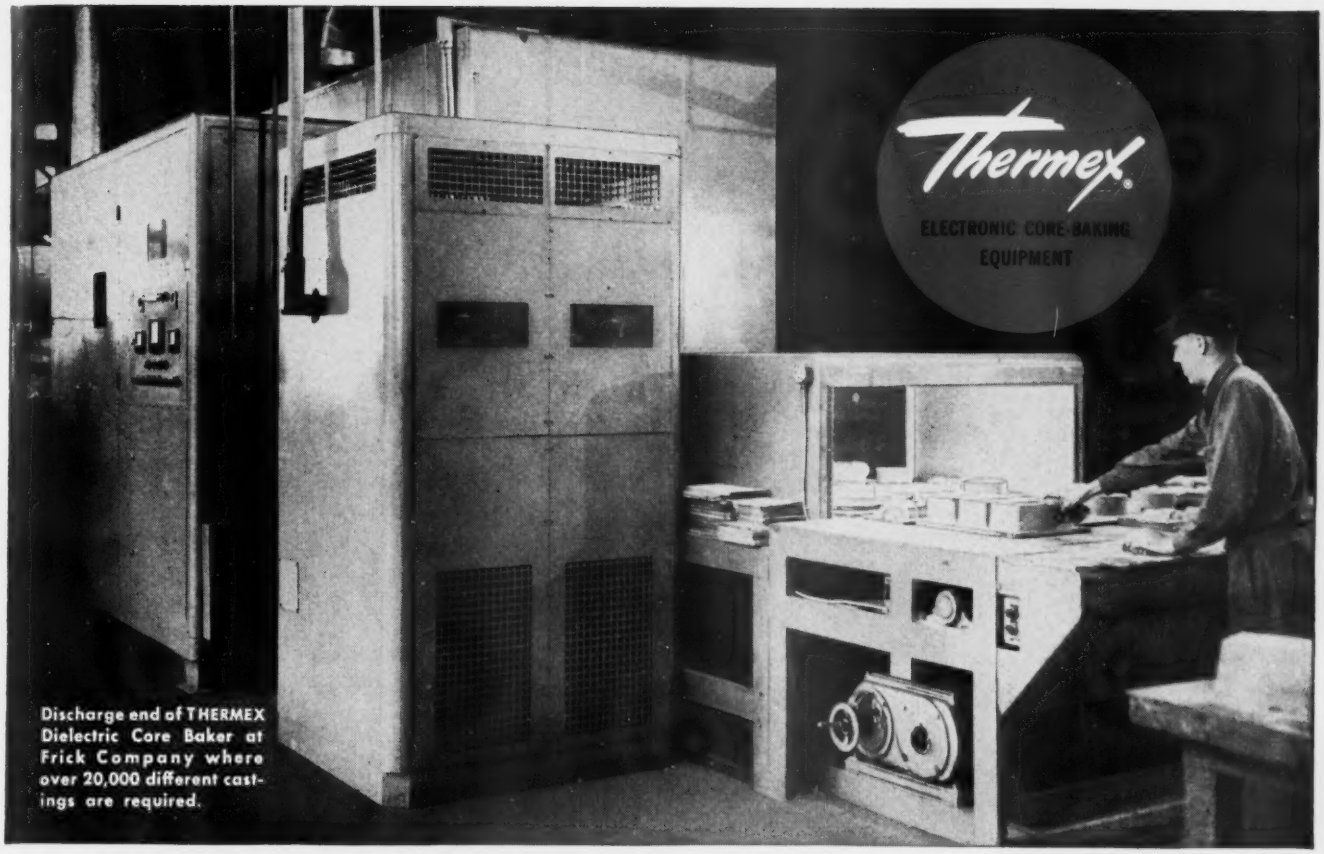


Discharge end of THERMEX Dielectric Core Baker at Frick Company where over 20,000 different castings are required.

How Frick Company has improved core quality and working conditions

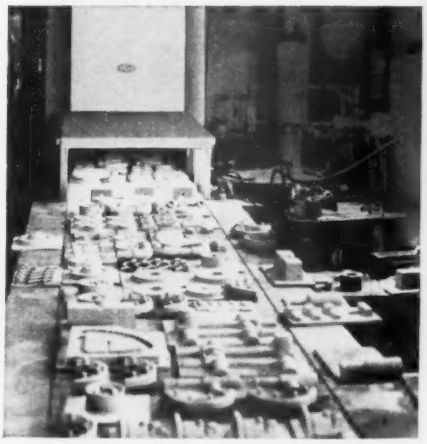
REPLACING conventional ovens with a 75 KW THERMEX* Core Baker at Frick Company, Waynesboro, Pa. has resulted in improved core quality . . . faster, more flexible production . . . a cleaner core room and saving of floor space.

IMPROVED QUALITY. Uniform electronic baking gives smoother core surfaces and greater dimensional accuracy. No longer necessary to paint cores to prevent iron penetration.

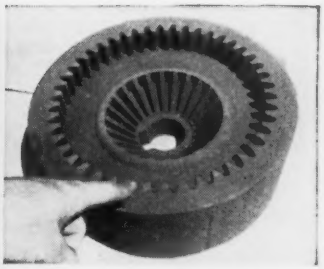
IMPROVED WORKING CONDITIONS. No smoke. No oven heat. Cores are cool enough to handle immediately after baking . . . move faster to finishing and pasting.

Find out how THERMEX Core Baking Equipment can improve your core room efficiency. Write today for data booklet on Electronic Core Baking. The Girdler Company, Thermex Division, Louisville 1, Kentucky.

*THERMEX—Trade-mark Reg. U. S. Pat. Off.



Intake end of THERMEX Core Baker showing variety of cores on belt, which moves at about 7 inches per minute. Typical Frick cores where accuracy is important: (Right above) For portable sawmill gear. (Right below) For ammonia valve body.



the **GIRDLER** Company

A DIVISION OF NATIONAL CYLINDER GAS COMPANY

THERMEX DIVISION

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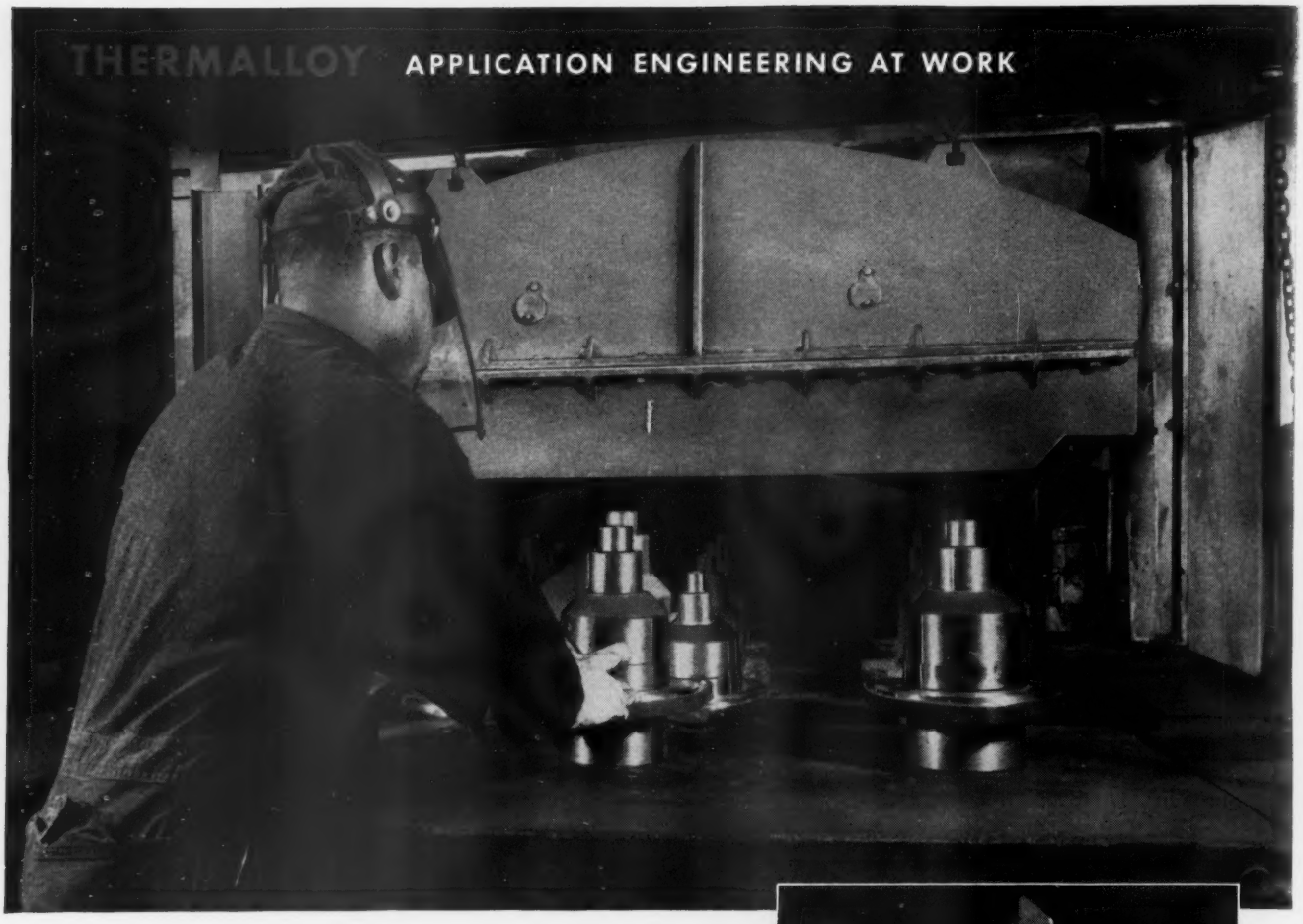
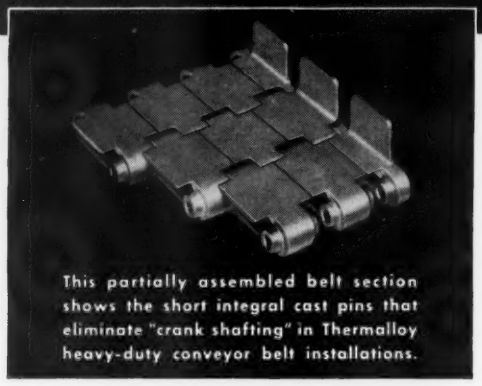
239 Newton Ave., Newark, Ohio • 624 So. Michigan Ave., Chicago 23, Illinois • 714 West Olympic Blvd., Los Angeles, Calif. • 1100 Craig St. East, Montreal, Quebec, Canada





This partially assembled belt section shows the short integral cast pins that eliminate "crank shafting" in Thermalloy heavy-duty conveyor belt installations.

specify THERMALLOY FURNACE CONVEYOR BELTS for heavier loads at high heat

55″ wide on bearing centers of 32′, this new furnace conveyor belt at Commonwealth Industries, Inc., Detroit, carries over 35 lbs. per sq. ft. in normal service. At times, a total of 5,000 lbs. and more is loaded on the belt. And it's versatile! Work ranges from ½ lb. to 100 lbs. per piece, temperatures up to 1650°.

Here was the problem. Commonwealth, modern commercial heat-treater for the automotive industry, needed a belt which could carry small and large parts to be heat-treated, in volume. They asked Electro-Alloys to help. Starting with the Thermalloy heavy-duty belt design, Electro-Alloys engineers designed special side links to keep the small work from rolling off into the furnace bed. The results have been higher production at less cost for Commonwealth, and another successful case history of Thermalloy application engineering at work.

Our permanent staff of engineers is ready to help *you* design, improve or modernize the alloy in your heat-treating installations. Thermalloy heat-resistant alloys are cast for many furnace and other heat-treat applications. Write us in Elyria, Ohio, for Conveyor Belt Bulletin T-241, or call any of the sales offices listed below.

*Reg. U. S. Pat. Off.

AMERICAN Brake Shoe COMPANY

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for faster release, fewer rejects...

use DOW CORNING Silicone RELEASE AGENTS

Developed especially for the metal casting industry, Dow Corning *Silicone* parting agents assure clean, easy release every time with a minimum of build-up on even the most complex patterns. They reduce your cleaning costs to the vanishing point, and speed production of uniform shells. See for yourself — send for *free samples* today!

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DOW CORNING 8 EMULSION

Widely approved by leading shell machine and resin manufacturers for applications where solvents cannot be tolerated. Noncorrosive and nonflammable, Dow Corning 8 Emulsion is easily diluted in hard or soft water . . . resists creaming or separation, both after dilution and in storage.

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DOW CORNING F-452 FLUID

One application of this new, easily diluted solvent type silicone parting agent provides easy release for several resin-sand shells. Easily applied to either hot or cold patterns . . . wets surface rapidly . . . leaves uniform silicone film that's heat-stable and oxidation resistant.

NOTE **— for best pattern break-in, use Dow Corning 7 Compound.**

send for FREE SAMPLE!

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MIDLAND, MICHIGAN

Dow Corning Corporation
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Please send me:
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- up to 10 ton capacity
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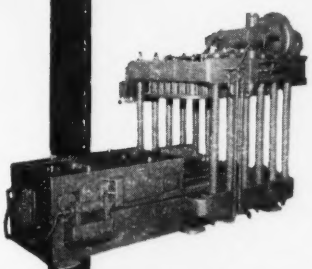

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Many of today's accepted foundry practices such as synthetic sand, southern bentonite, chemical sand additives, cupola "gun patching" and pressure and diaform molding stem from *Eastern Clay's* pioneering, research and developments in materials, equipment and methods.

You can get from *Eastern Clay* this wide variety of materials and equipment plus modern technical know-how on improved operating efficiencies and the production of finer quality castings.

So call your *Eastern Clay* representative. You'll get prompt, understanding and helpful cooperation.

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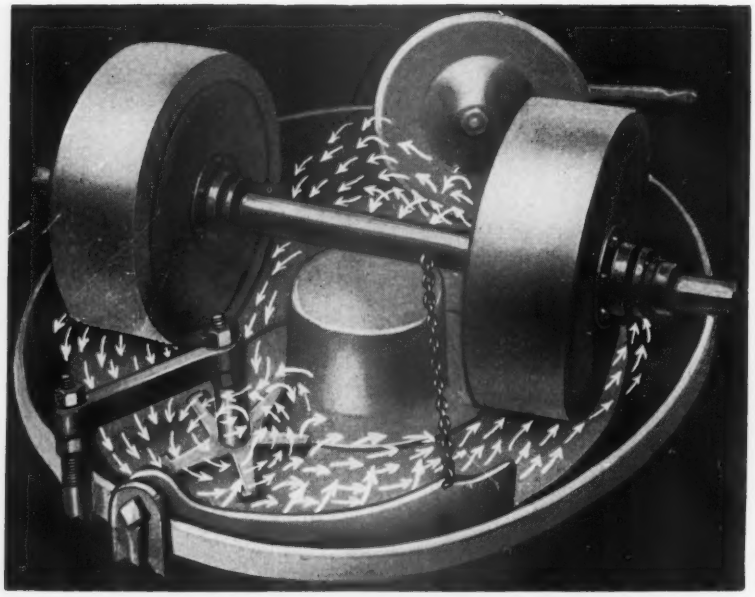
the STAR feature of a CLEARFIELD MIXER

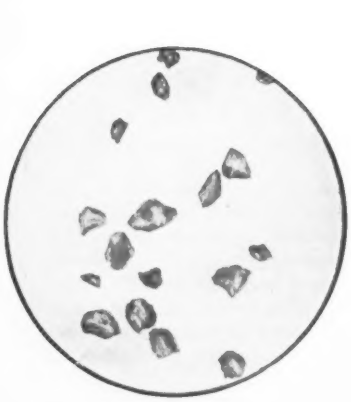


Here is what it does:

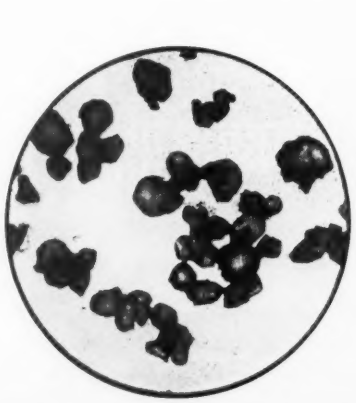
1. Speeds up the mixing process
2. Improves the sand quality
3. Breaks down all lumps
4. Prevents cake formation
5. Frees bottom surface of all material
6. Promotes clean emptying of the pan

is the STAR-Shaped agitator in the revolving pan!

The agitator is attached to an arm suspended in the revolving pan. As the pan bottom revolves, the sand strikes the agitator causing it to turn rapidly. This creates an intense mixing action, preventing any buildup of material on the bottom of the pan.



VISUAL EVIDENCE of the effectiveness of Clearfield Mixers is provided by these photomicrographs. Above, unbonded silica sand. Below, the same sand bonded in a Clearfield Mixer.



Clearfield Mixers are available in any size to meet your sand preparation requirements. Write today for our catalog No. 83.

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Detroit Electric Furnace Announces

LIBERAL LEASING PLAN

Get production savings from Detroit ROCKING Electric Furnaces without heavy capital investment

A liberal leasing plan is now being offered by Detroit Electric Furnace to allow more foundries to enjoy the production economies of these exceptional indirect arc electric furnaces. Now manufacturers can have modern, efficient metal melting equipment without large outlays of working capital.

Under the DEF leasing plan, you'll find that manufacturing savings from reduced melt losses, less scrap, and savings in labor and time will more than pay for the furnace lease.

The original lease term of three years requires a reasonable deposit and a low monthly rental computed on the commercial purchase price of the equipment. Lease may be renewed for two more three-year terms at considerably reduced rentals. Minimum value of equipment which will be leased is $5,000.

A lease renewal or a purchase (fair market value) option may be exercised at any time after the initial three-year term.

This leasing plan is available on all Detroit Rocking Electric Furnaces and equipment. Take advantage of this opportunity to have these famous furnaces working for you *without large capital investment.* A letter to Department L, Detroit Electric Furnace Division, will bring you complete information.

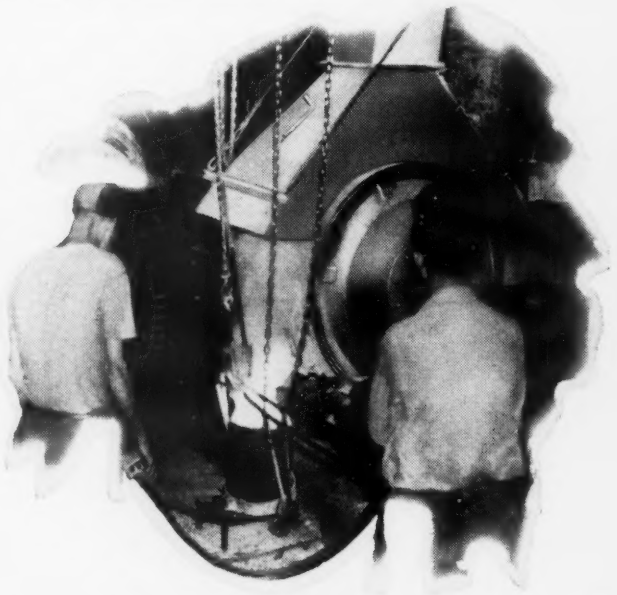
Here's what users say about Detroit ROCKING Electric Furnaces

A brass foundry writes—

"We have been using Detroit Electric Furnaces for many years and at present have 4 of your Type LFN #500, which have proven most satisfactory. Your furnace equipment has enabled us to produce our hot metal requirements for our foundry with approximately one-fourth of the labor required with other type melting equipment, with approximately 70% saving in our metal shrinkage, as well as a saving in fuel and maintenance cost."

A gray iron and alloyed castings producer—

"Over a long period of years we have successfully used Detroit Electric Furnaces and we have demonstrated to our own satisfaction that they have a definite place in our melting operations. As far as we are concerned, certain of our gray iron and alloy iron castings are produced with best results in our Detroit furnaces."



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KUHLMAN ELECTRIC COMPANY • Bay City, Michigan

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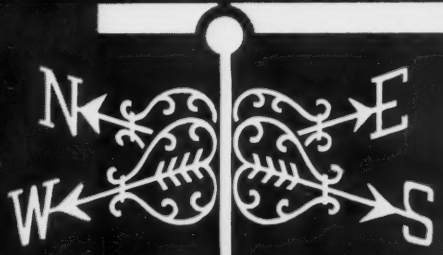
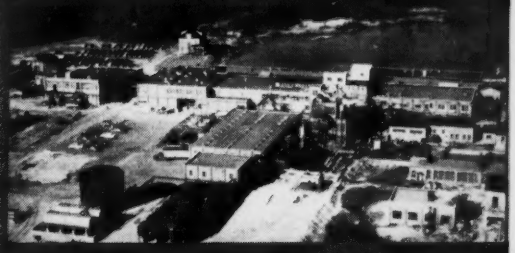
UREA AND PHENOLIC Shell and Core Binders





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Catalin Service *Speeds* Quality—in Quantity!

Catalin, pioneer producer of an extensive range of urea, phenolic, cresylic, resorcinol, melamine and styrene formulations . . . is proud of its product reputation, and prompt service from all three of its modern processing plants: these as pictured hereon are most desirably located in the East, Midwest and South.

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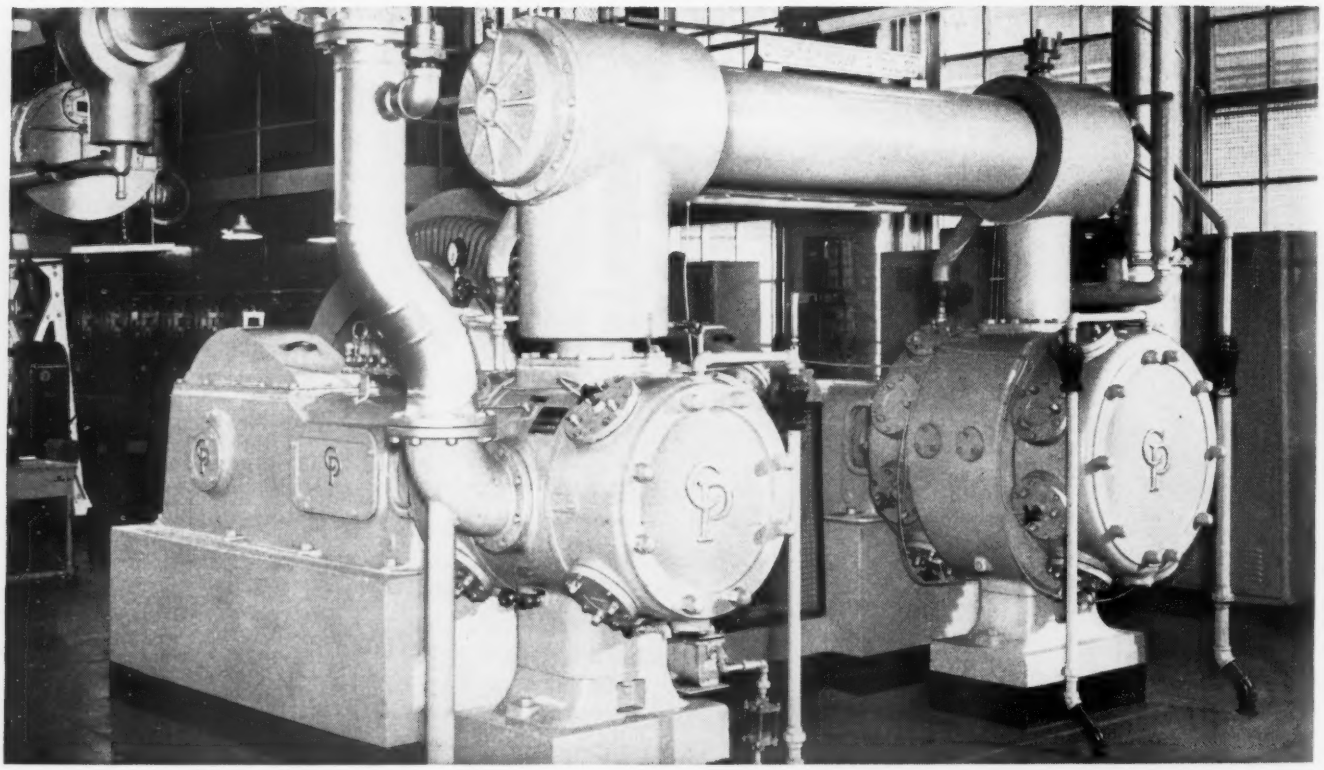
this trade mark...

key to compressor dependability



The dependability of CP's heavy-duty Class O-CE horizontal duplex compressors is reflected in repeat orders. Typical of these is one from a prominent electrical manufacturer: The first CP Compressor in this plant—300 HP size—was installed in 1935 . . . the second—rated 400 HP—was added in 1951. Both operate continuously, with remarkably low upkeep . . . and they should be "going strong" in 1975.

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Now you can HARDEN CORES in 12 seconds by the magic of the CO_2 PROCESS using STEINEX*

You will be amazed with the ASTOUNDING RESULTS in FASTER PRODUCTION and LOWER COSTS

This large core, *weighing several tons,* was hardened in a matter of seconds by the STEINEX CO_2 Process. Such cores can be made up right on the molding floor with great reduction in handling costs!

Cores are hardened right in the corebox.

ELIMINATE drying ovens, core dryers, core plates and a large percentage of nails, wires . . . and handling costs!

Cores may be cast IMMEDIATELY *without* core wash! No waiting. No storage. Save a whole day on rush orders.

Greatly improved accuracy — casting tolerances may be held to a few thousandths.

STEINEX*

STEINEX is a remarkable core sand binder. Cores and shell molds, made of sand mixed with STEINEX, can be hardened in a few seconds by the injection of carbon dioxide.

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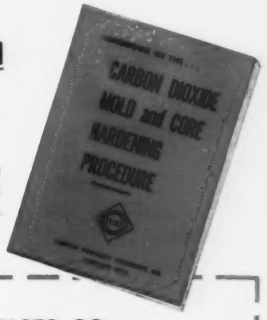
Get your ***FREE*** copy of this new 36-page "HANDBOOK OF THE CARBON DIOXIDE MOLD AND CORE HARDENING PROCEDURE."



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Chilled shot and grit — for blast cleaning of large, heavy jobs. Unexcelled for toughness, long life, better cleaning.

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No matter which of METAL BLAST'S three abrasives you choose for your blast-cleaning requirements —you'll get unexcelled efficiency and economy. For these are *good* abrasives—made of top quality materials, on modern equipment, with the greatest of care. If you aren't fully satisfied with the abrasive you're now using, why not try one of these three? Send in your trial order today!

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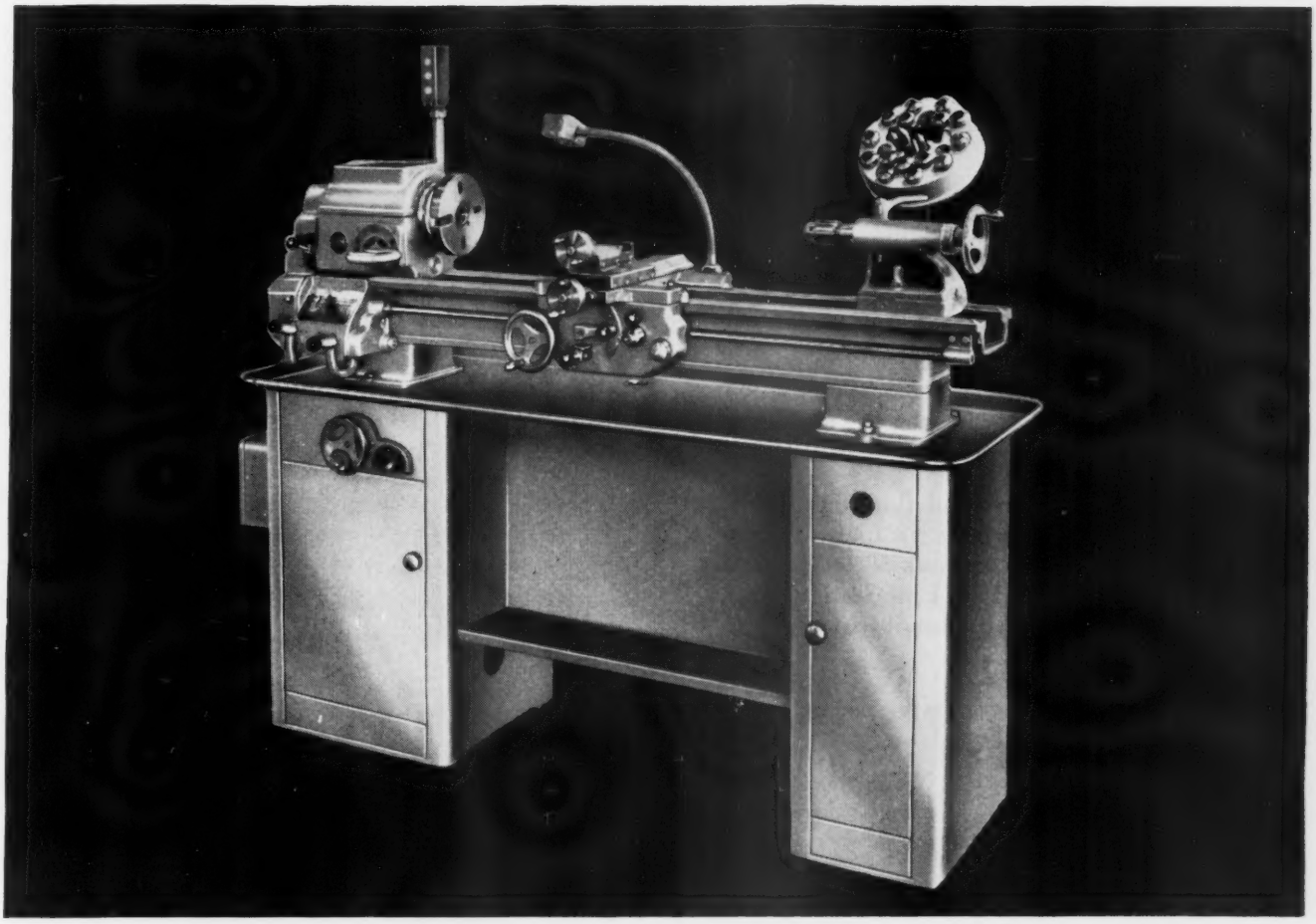
ROCKWELL-BUILT

now, a great new long-bed DELTA 11" metal cutting lathe



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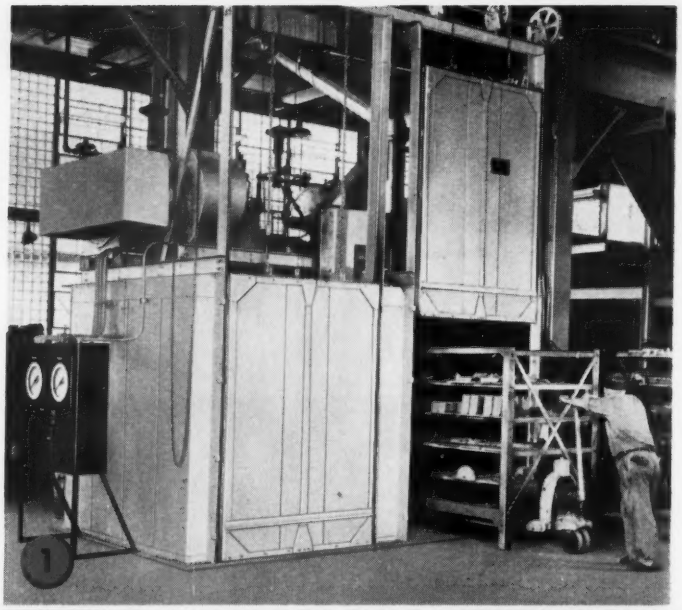
That's right, for any baking requirement there's a Carl Mayer oven that will do the job faster and cheaper, to give you the efficiency so necessary in today's competitive markets.

The exclusive heat recirculation and slotted panel construction features cut fuel costs and heating times by as much as 50%. Uniform temperatures, assured by heat recirculation, guarantee perfect baking conditions throughout the entire oven.



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Write for Bulletin 53-CM

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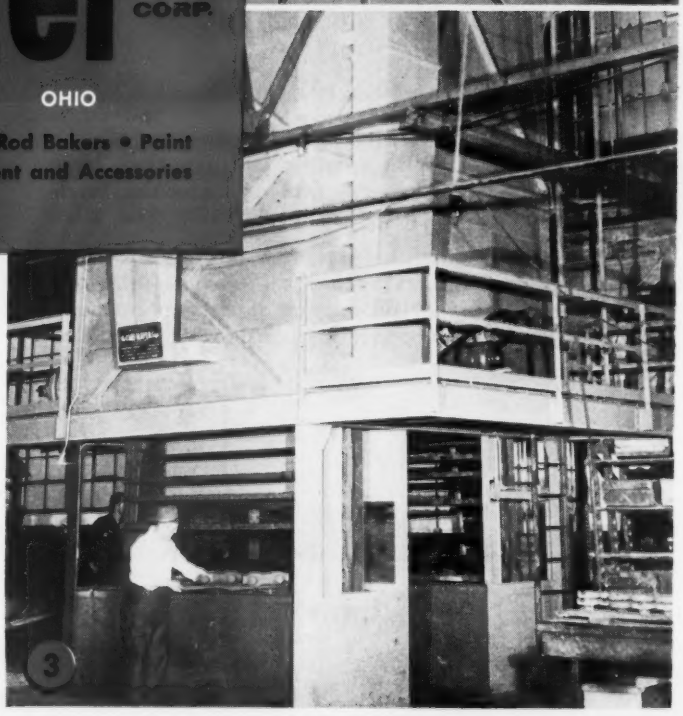
1. This rack type oven, with heat recirculation, holds temperatures within ±5° throughout the oven.
2. Patented downdraft heating method on this car type oven increases efficiency up to 50%.
3. This vertical oven features the patented internal heat fan — increases efficiency, lowers maintenance cost.



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40-E Aluminum Alloy

with this composition* can give you these average properties

Zn	—5.0 —6.0	Cu	— .30 Max.
Mg	— .50— .70	Si	— .25 Max.
Cr	— .40— .60	Mn	— .30 Max.
Ti	— .15— .25	Al	—Remainder
Fe	—1.0 Max.		

* Protected by Comstock Patent 2146330. Alloy Data Booklet will be mailed free, giving complete story on 40-E Alloy. Write for your copy — today!

Yield Point — 30,000 lbs.
Tensile Strength — 37,000 lbs.
Elongation . . . 5%
Shock Resistance — Withstands direct and transmitted shock
Corrosion Resistance even in stressed condition
Excellent Machineability
Fine Grain. Withstands High Pressure.
No Heat Treatment Necessary.

Here's what happens when attempts are made to develop an Aluminum-Magnesium-Zinc Alloy *without infringing on the FRONTIER 40-E Patent*

- Copper Increased . . . . RESULT: Embrittles the alloy, reduces the elongation and tensile strength and increases stress corrosion.
- Silicon Increased . . . . RESULT: Reduces all physical properties.
- Manganese Increased . . RESULT: As manganese is increased over 0.4% the elongation and tensile strength are relatively reduced.
- Tin Added . . . . . RESULT: Yield Point and Tensile Strength reduced.
- Lead Added . . . . . RESULT: Additions of even small fractions of a percent have a decided effect on reducing tensile and yield strength.

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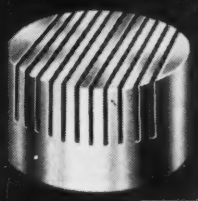
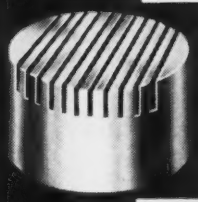


SLOTTED
X-TRA DEEP HEAD .156
Wide Slots .014



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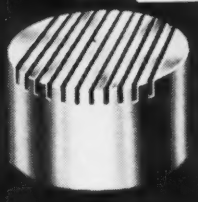
.014 .010



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Readers' Comment

Shell Molding Machines

TO THE EDITORS:

Mr. Shallenberger's comment (October, page 96) contained a wealth of useful information and good advice. However, I cannot agree with all of his statements. I happen to know of one foundry that built shell molding equipment and later added automatic features to the original machines. This equipment includes a homemade coreblower. This foundry produces excellent castings in both ferrous and nonferrous alloys. The initial cost was very low, maintenance is low and operational cost reasonable.

Another point discussed was the relative advantage of automatic units over manual machines. Since time cycles are all important, it seems that automatic timing would be most valuable. Unless provision has been made by the manufacturer for adding automatic controls to the manual machines, I would be inclined to agree with John Steinebach that the original equipment should be at least semi-automatic.

CHET MACK

Route No. 4
Jamestown, N. Y.

* * *

Pricing Practices Changing

TO THE EDITORS:

Congratulations on the editorial in the November FOUNDRY. I think it is very appropriate, particularly at this time when the foundry industry is emerging from a highly competitive situation in which price was the paramount consideration for both the salesman and the buyer.

I think if foundry salesmen would educate their customers in the amount of knowledge and skill necessary to produce a satisfactory casting, both would benefit greatly. Unfortunately, the foundry industry has been considered anything but a "Fancy Goods" producer for many years, but I think we are gradually improving our status in that respect and editorials like yours will help very much.

R. S. MUNSON
Vice President

Atlantic Steel Castings Co.
Chester, Pa.

• • •

Foundry Education

TO THE EDITORS:

I would like to congratulate you for your editorial which apppeared on page 111 of the September issue. As a foundry instructor here at Penn State, deeply interested in the secondary school aspects, I heartily agree with all your statements.

Would it be possible for us to obtain reprints of that page or permission to reproduce it. We would like to effect a general distribution throughout our state and area in an effort to spread the gospel.

W. P. WINTER
Foundry Instructor

Department of Industrial Engineering
The Pennsylvania State University
University Park, Pa.

* * *

Process Stories Interesting

TO THE EDITORS:

The writer wishes to compliment you on the two articles, "What About Shell Molding," and "The CO_2 Process" which were most interesting.

D. CHAIET

Canadian Foundry Supplies & Equipment Ltd.
49 Main St.
Toronto 14, Ont.

* * *

Clipping Made Easier

TO THE EDITORS:

I am so glad that "one of your faithful readers," as you put it, protested the continuation of articles started in the front part of FOUNDRY in the back part of the magazine.

We, too, clip many articles from FOUNDRY and have found it difficult to assemble all of the parts when they were scattered throughout the book. It had never occurred to us, however, to protest. We thought that it was a necessary evil.

It will be much easier, now, to clip and file the many valuable articles which appear in each issue.

J. WILLIAM HORAN
Chief Metallurgist

American Crucible Products Co.
Lorain, O.

* * *

Man-To-Man

DEAR MR. LEE:

I have read your Man-to-Man articles in FOUNDRY, finishing, for the moment, with the one in the May issue—the one about leaders.

I have often had the urge to write and thank you for what you have written—this time I am doing so, in spite of finding I don't measure up very well against your list! I have appreciated your articles, particularly those on the human side, on which you are so strong. I quite agree that is the more important.

P. J. DAVIES

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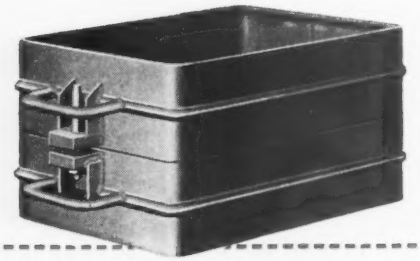
Buffalo Foundry Replaces Cast Iron Flasks with STERLING Rolled Steel Sections



Type illustrated is a Sterling Rolled Steel Channel Flask, Style "ASU", with single pin lugs and equipped with loop handles — one of the many Sterling Flasks now being used by this progressive Buffalo foundry.

Originally this foundry, one of many foundries operated by one Company, used cast iron flasks for producing castings. After years of research they discovered that Sterling Rolled Steel Channel Flasks help to produce quality castings at a lower cost per year. Today, more than 30,000 Sterling sections are currently rolling along the conveyor lines in most of their plants.

Sterlings are engineered and built for tough foundry service. They combine maximum strength with minimum weight. Each section forms a solid, rigid piece and is equipped with welded fittings. Sand flanges at top and bottom have fillets so that sand will pack under flanges. A heavy reinforcing rib is rolled in the center of each section to resist torsional and other strains. Flanged surfaces are machined to a close tolerance.

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WHEREVER METALS ARE CAST . FOUNDRY

December 1955

You Need a Program

Bureau of Labor Statistics of the Department of Labor recently published Report No. 85, containing "Case Study Data on Productivity and Factory Performance of Five Small Gray Iron Foundries." While the study was prepared for the Foreign Operations Administration for possible distribution abroad, the selection of the five plants possibly has not been sufficiently broad to provide an accurate cross section of small gray iron foundry operations in this country. It is doubtful if foundrymen abroad will learn too much about productivity of a modern small foundry by consulting this study.

Nevertheless, the report reveals situations which should be of interest to the industry — for example, the matter of safety and accident prevention. All five foundries reported no formal safety program. All indicated they provide certain types of safety equipment, such as goggles, gloves, leggings and aprons, and that workers are warned of possible dismissal if the equipment is not worn.

While lost-time accidents appear rare, the report leaves the feeling that minor accidents may be fairly numerous. The disturbing part of the picture is provided by the following data on one foundry:

"No serious accidents occurred in the foundry in the past 3 years. Those accidents which did occur, resulted in very little loss of worktime. They caused minor injuries which rarely required more than one visit to a doctor. The clean and ship department experienced the highest incidence of accidents in the foundry, with five or six eye injuries per month. This resulted from flying iron particles. The molding department was next highest in rate of accidents with two or three injuries per month. These were burns caused by molten iron sparks during the metal pouring operation. Negligence on the part of employees in failing to wear the protective goggles or aprons supplied by the company was the prime cause of these accidents."

How could a foundry management continue to tolerate such a situation? Surely the possibility of more serious eye injury would move management to action. How soon will one of the "five or six eye injuries a month" lead to total blindness of a worker?

Frequently we see the slogan "Safety Is No Accident." Safety becomes real only when top management believes in it; is willing to devote time and effort in developing a formal program; has responsibility delegated to one man; and is willing to demand that workers follow the rules of safety or find employment elsewhere.

Safety is a problem for every type of foundry, both large and small. Help is available from the various trade and technical associations, and the efforts of those organizations have produced considerable progress in reduction of accidents. But much remains to be done.

So, if your plant does not have a *formal* program, get one. Regardless of how simple, a plan with management insistence and assignment of responsibility should do wonders.

Frank G. Steinebach

Editor

Magnetic Particle Inspection Standards

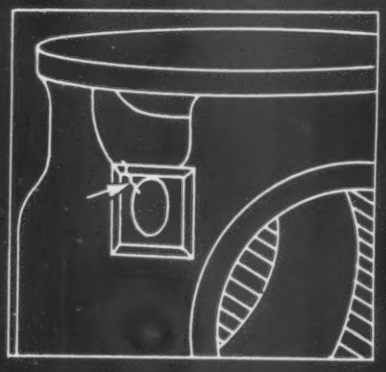


Fig. 1a—Crack through hole will grow and cause a fatigue failure in service

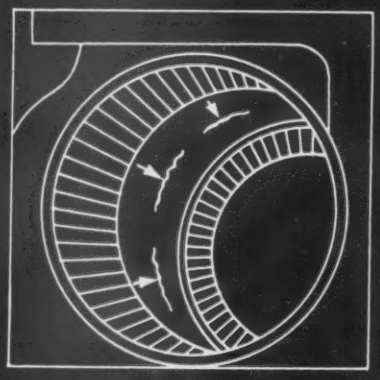


Fig. 1b—Defect on inner surface of the same casting would not cause service failure

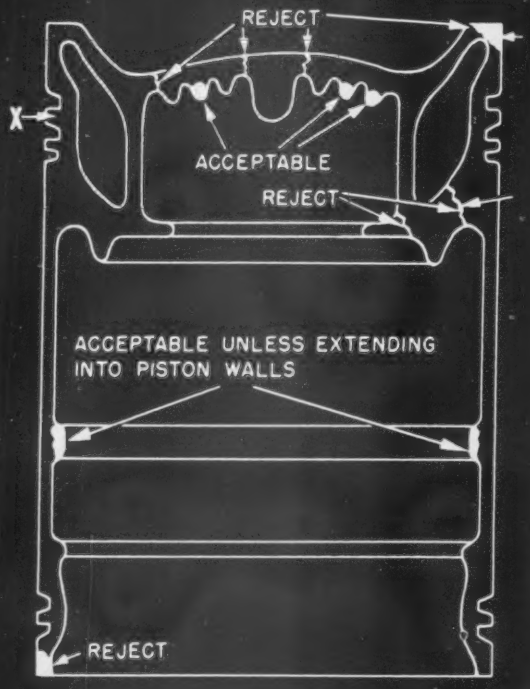


Fig. 2—In piston, acceptance or rejection is based solely on location, and orientation of defects. The X at left shows area where cracks are unacceptable

Pointing out that the lack of magnetic particle inspection acceptance standards drives some persons to insist on perfection, the author outlines what sorts of standards are required and are realistic. Acceptance or rejection of a casting should not depend solely on the presence of defects

By JOHN B. CAINE
Foundry Consultant
Cincinnati

MAGNETIC particle inspection currently is the only major testing procedure without standards of acceptance. About the only present standard involves someone pounding on the desk and shouting, "We want no cracks in our parts!" This table-pounding is extending to specifications. At least one specification is now being written that states, "No magnetic particle indication, regardless of length, will be accepted."

This requirement calls for perfection, for the magnetic particle test magnifies one dimension—width—to infinity. A discontinuity even one atom wide will produce poles in a magnetic field that attract a magnetic powder to make the discontinuity just as visible as one a fraction of an inch wide. Perfection *can* be furnished—at a price. If the magnetic particle test is applied indiscriminately, with no standards, it will only increase cost with no increase in true quality—that is, serviceability.

At the same time, magnetic particle inspection cannot be dismissed as too sensitive and therefore of no practical value. Tiny discontinuities, if cracklike in form, in an area of high stress and oriented in the proper direction can cause stress concentration high enough to cause service failures. The narrower the cracklike discontinuity, the sharper the notch and the greater the stress concentration. Sharp, relatively deep cracks, even though invisible, can increase stress concentration to values exceeding even a generous factor of safety.

Radiography has just emerged from this state of table pounding. A.S.T.M. standards for radiographic soundness now are accepted, and experience has proved that serviceable castings subject to very high stress can be specified and produced to a degree of imperfection and at a reasonable cost. The tension test itself is a test of relative imperfection. If steel were perfect, we could expect tensile strengths of over 1 million psi.

A few companies have initiated private magnetic particle inspection standards. It is interesting to review some of these standards to see what is and what is not acceptable on the basis of actual service performance. Fig. 1 illustrates a casting of which service performance has proved that an indication of a crack through a hole, as in Fig. 1a, will grow and ultimately will result in fatigue failure in service. Indications found on the inner surface, as in Fig. 1b, have been proved by service to be benign and to have no detrimental effect on serviceability.

Fig. 2 shows another example of magnetic particle standards based on service performance of a casting. The shape is now a piston, a rather complicated shape. Note that acceptance or rejection is based solely on the location and orientation of the defect as brought out by magnetic particle inspection.

These two standards apply only to these particular castings—that is, to these particular shapes. The shape of a casting is usually complex. For a more nearly basic understanding of the whole problem, it is necessary to study simpler shapes and the effect of defects brought out by magnetic particle inspection on the serviceability of these simpler shapes. Shape, along with location and orientation of the indication are major variables in determining whether a particular indication is dangerous and cause for rejection or whether it is benign and can be ignored. A magnetic particle indication usually shows up a cracklike rupture of some sort. The inspector is concerned about possible stress concentration causing either fatigue or notch brittle failure in service.

It is necessary to go to forged shapes to study the simpler ones, for information is lacking on similar cast shapes. Except for details as to the origin of the defects, the information derived from forged shapes is directly applicable to castings. Probably the most simple shape to start with is that of a stepped shaft, a shape subject to torsional and bending stresses. The crankshaft is one such shape that has been studied.

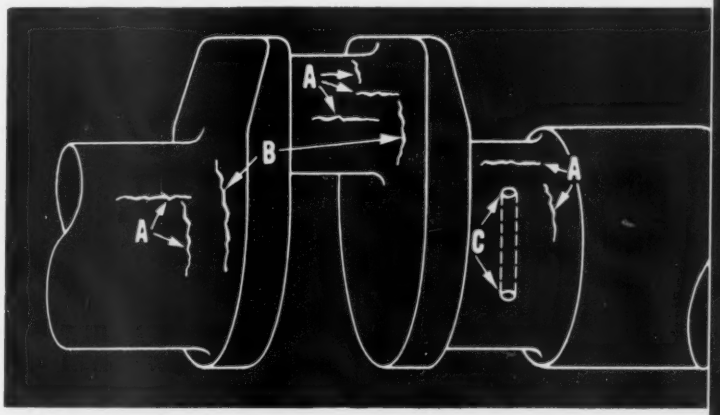


Fig. 3—Magnetic particle inspection standards for crankshafts. *A*—Longitudinal or transverse indications 1 to 1½ in. long and 1/16-in. deep are acceptable away from fillets or oil holes. Up to four shorter indications per bearing are acceptable. *B*—Unless indications in fillets are under ¼-in. long, crankshaft must be scrapped. *C*—Crankshaft must be scrapped when indications at the oil holes are not less than ½-in. long

Several magnetic particle inspection standards for crankshafts have been issued. Even though these standards have been arrived at independently, they are in surprising agreement. These standards are summarized in Fig. 3. Indications of quite large cracklike defects are allowable, even for lightweight diesel engine crankshafts, provided they are not located in the highly stressed areas, at the fillets and oil holes. These findings need not be restricted to crankshafts, but can be expanded to shafts in general. If the indication is at a fillet, hole, change in section or any other area that in itself imposes stress concentration, it is potentially dangerous. In other areas it usually is benign and can be ignored.

There are two exceptions to these generalities. One is a uniform shaft or section. Although the writer can find no references to actual service data,

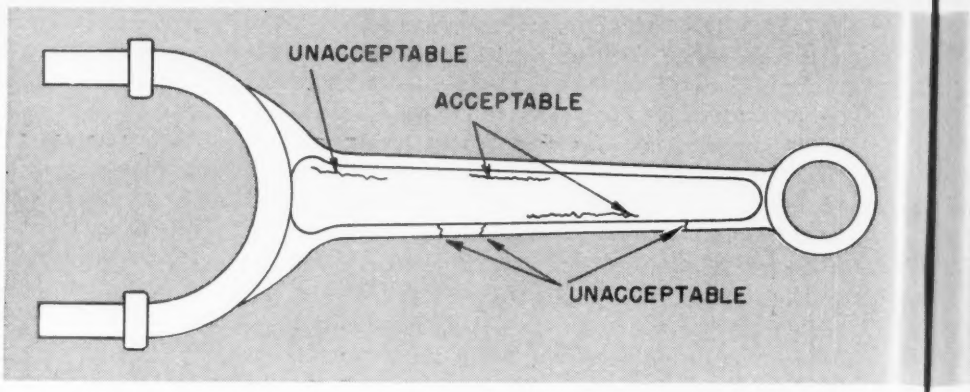


Fig. 4—Acceptance standard for indications on a connecting rod also shows that acceptability depends on location, also on orientation

theoretically any defect in a uniform section is dangerous if oriented in the proper direction. Orientation and depth are now the major variables. The other exception has to do with very low factors of safety, say under 2.0. Such low factors of safety are not used in commercial design and when used impose so many special problems that they must be considered as special cases.

Another shape of basic importance is the connecting rod. The load transmitting member of the connecting rod is an I-beam section under tensile, compressive and transverse loading. At least two studies[1] have been made on connecting rods, correlating magnetic particle indications with serviceability. The results are summarized in Fig. 4. Quite large indications are permissible in the web and the fillets of the I-beam junctions, unless they are close to the section change from the I-beam to bearing sections. Any type of transverse indication in the raised members of the I-beam section is unacceptable. Again, acceptability depends on location and orientation. The surfaces of the raised members of the I-beam section carry the highest stress, and the web member is under low stress. Discontinuities in the metal of the highly stressed areas therefore are dangerous. Those in the areas of low stress are benign.

The few examples just discussed illustrate highly stressed shapes, stressed in tension, compression, torsion and bending. It seems possible to advance some preliminary magnetic particle inspection standards based on these findings. These tentative recommendations are supported by theory, as will be discussed later.

Relatively Dangerous Magnetic Particle Indications (in areas of high stress): 1. Indications in a uniform section, perpendicular to tensile stress or parallel to bending and torsional stresses. 2. Indications extending around a corner, as in Fig. 4. Such indications are particularly dangerous if the indication is in a raised member and transverse to the stress. Internal corners formed by holes, like those in Figs. 1 and 3, fall in this category. 3. Indications in fillets and changes of section that, in themselves, impose stress concentration, like those of Fig. 3. Peripheral indications are particularly dangerous, longitudinal indications less so. 4. Indications, especially transverse, at the ends of stiffening members, supporting brackets or webs.

Relatively Benign Magnetic Particle Indications: 1. Indications in a uniform section parallel to a tensile stress or perpendicular to bending and torsional stresses. 2. Indications, especially longitudinal, in platelike members stiffened by ribs. Indications in depressed fillets of such shapes, like those in Fig. 4. 3. Indications away from fillets or any stress raisers, as in Fig. 3, particularly if longitudinal. The acceptability of peripheral indications of this nature depends not only on the length and depth of the discontinuity, but also on the design itself.

This relatively simple set of rules covers a surprisingly large number of shapes. In case of doubt, stress analysis is available to check the actual stress concentration in any given part. If time and ingenuity are available, a stress concentration study by either brittle-lacquer or strain-gage techniques will give exact data. If the indications are shown to impose areas of high stress concentration, they are dangerous. If no high stresses show up around the indications, or if areas of higher stress are shown to be present due to shape, the indications most probably are benign.

Unfortunately, the best criterion of the effect of a defect discovered by magnetic particle inspection—that is, actual service performance—is neglected at present. If magnetic particle indications are found on a part when such inspection is started and the part has performed satisfactorily in the past, such indications should be used as data as to relative stress concentration, not as a basis for summary rejection, as is almost universal practice at present. Such indications are almost certain to be benign, and the proof is the past performance of the part. The probability of harmful defects starting at the same time magnetic particle inspection is initiated is nil.

The empirical findings just discussed are supported by theoretical and experimental data. For example, it has been established, theoretically and by experiment, that the stress concentration imposed by design at the fillet of the stepped shaft in Fig. 5 is about 1.6; that is, the actual stress

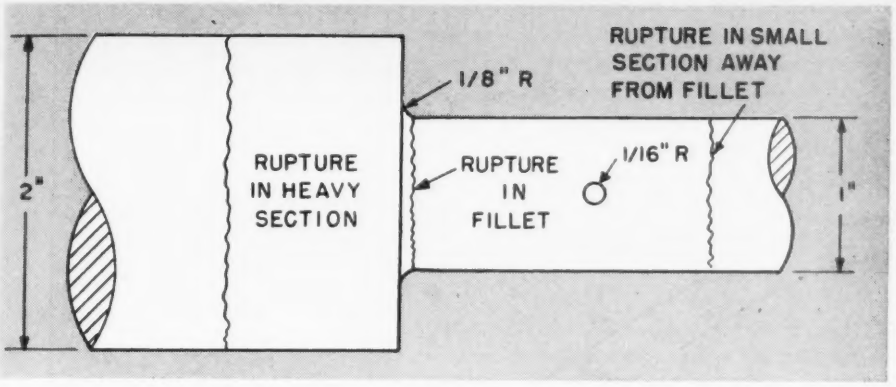


Fig. 5—Approximate theoretical stress concentrations in a stepped shaft. Exact values vary with dimensions

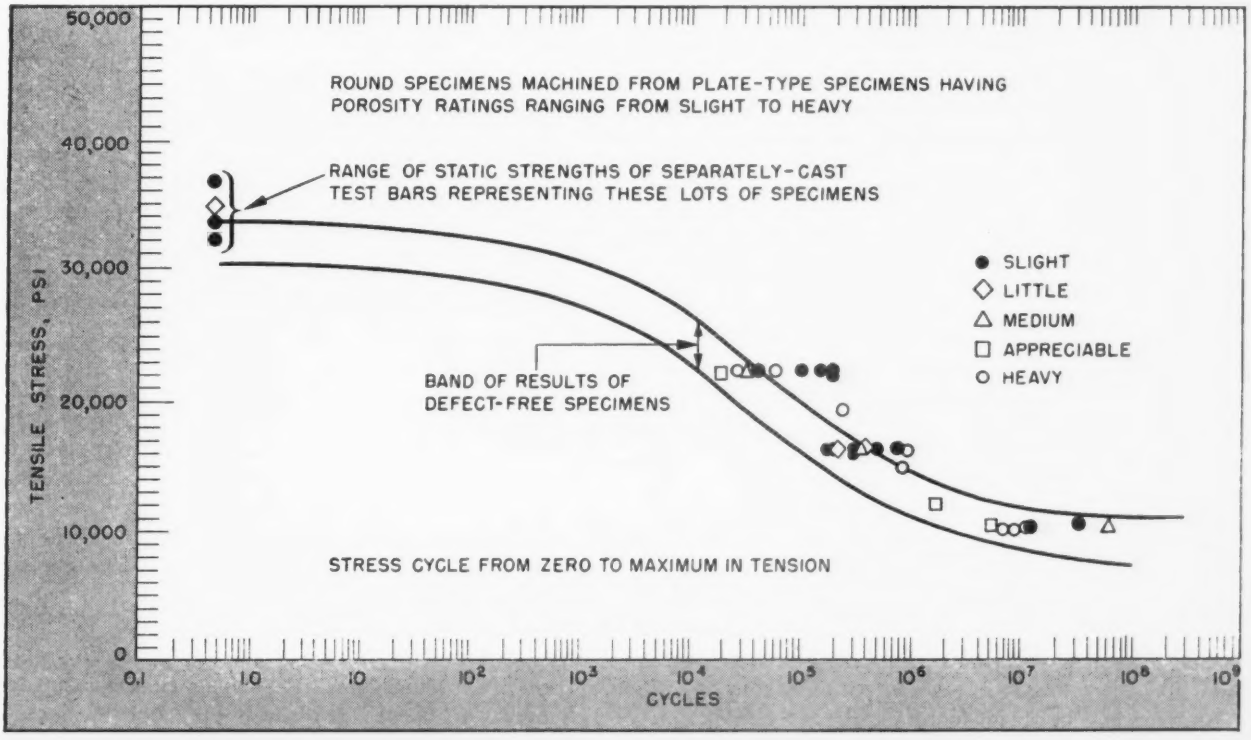
at this fillet is 1.6 times that of the calculated over-all stress. Only approximate values can be given, for the exact stress concentration values are dependent on dimensions.

A stress concentration of about 1.6 is present if the metal is perfect. If a cracklike discontinuity is present, extending completely around the fillet, with a depth of 1 per cent of the shaft diameter, it will impose an additional stress concentration factor of about 5. These two factors are multiplied, giving a total stress concentration of 8, a value exceeding even a generous safety factor of 5. The shaft is almost certain to fail in service because of fatigue, regardless of the physical properties of the metal.

A similar peripheral crack in the larger diameter will impose stress concentration on the order of about 5, even if ¼ in. deep. Because of larger section modulus of the 2-in.-diam section, this degree of stress concentration is reduced to about 1.3 in relation to the fillet. This figure is less than the stress concentration because of the fillet itself, and the weak spot is still the fillet. The stress concentration due to a rupture in the uniform 1-in.-diam section is decreased, when compared to the fillet, by a factor of 1.5 to 4 depending on the location of the rupture, because of the lever law.

It must be emphasized that completely circumferential ruptures and indications of such ruptures still are to be looked upon with suspicion. However, most magnetic particle indications show short ruptures, only a small fraction of the circumference, even though they are peripheral in direction.

Fig. 6—In cast aluminum, dispersed, rounded defects like porosity do not lower the fatigue strength below the band of values expected from a perfect specimen[2]



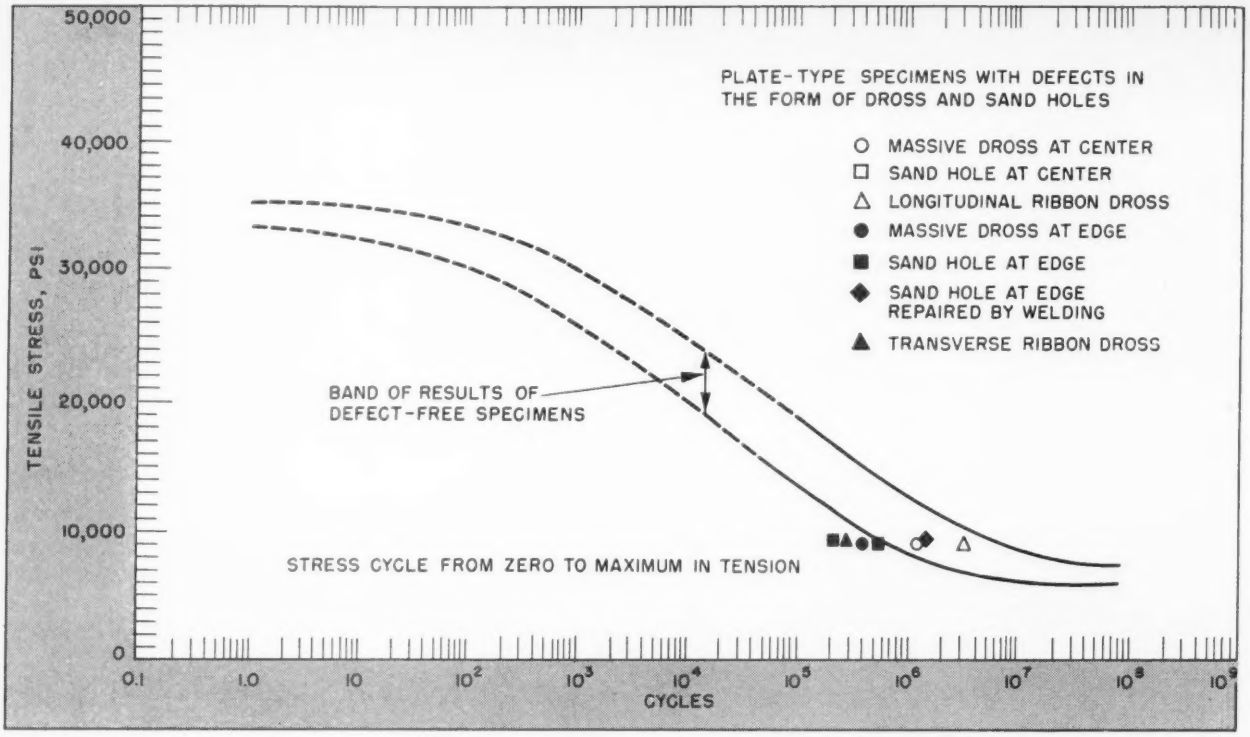


Fig. 7—Fatigue strength of cast aluminum is lowered if a defect is at a corner or an area of high stress or is a defect in line, like line dross, for example[2]

Another dividing factor must be used, its value depending on some relation between the length of the indication and the circumference. This fact means that the stress concentration values for completely circumferential stress raisers must be divided by factors of 2 to 5 as their length is decreased. The resulting stress concentration factors, will, many times, be lower than those imposed by design and shape.

It is because of these facts that magnetic particle inspection standards concentrate on indications in fillets and allow relatively large indications on uniform sections away from fillets.

Another point of high stress concentration imposed by design necessity is small holes. The hole shown in Fig. 5 imposes a stress concentration in excess of 2. The danger of additional stress concentration due to defects in these areas is self-evident. This point is recognized by the specifications.

Similar stress analyses can be made for the I-beam section of the connecting rod or for any other simple shape and confirm the empirical findings derived from service.

Fatigue studies also confirm these points. Holt[2] has determined the effects of a number of casting defects on the fatigue strength of cast aluminum. Fig. 6 is evidence that dispersed, rounded defects like porosity do not lower the fatigue strength below the band of values expected from perfect specimens. If the defect is at a corner, an area of high stress or a defect in line like line dross, the fatigue strength is lowered as shown in Fig. 7. The decrease in these instances is not catastrophic—on the order of 15 per cent. Space does not permit a full discussion of this work. See the reference for details. The prime importance of location and orientation is confirmed by these fatigue studies.

The same correlation applies between casting defects, whether visible or found by nondestructive testing and notch brittle fracture. Fig. 8 illustrates a small portion of the work of Pellini, Brandt and Layne[3] on this subject. This work proves that shrinkage voids, sand defects, voids due to entrapped gas and dispersed shrinkage do not affect the resistance of cast steel to fracture due to explosive force at temperatures down to plus 20°F. It was found that such defects did not cause premature fracture and that the deformations at fracture of specimens containing rounded, dispersed defects fell within the range established by defect-free specimens. This work specifically excludes crackline defects. The accent now is on the shape of the defect.

Although Holt's work is specific only about cast aluminum and the work of Pellini, Brandt and Layne concerned only cast steel, there is no reason to doubt that the fundamentals apply to all cast metals. These two properties, fatigue strength and resistance to notch brittle fracture, are far more dependent on stress concentration than on the classical mechanical properties of the metal itself.

The preceding paragraphs should not be misconstrued as condoning defects. Although sand defects and blows will not cause the casting to fall apart in service, they still play hob with ma-

chinability and must be eliminated. Shrinkage in castings that must contain pressure will cause leakers, and the casting is worthless, no matter how resistant to rupture. A reorientation of thinking is necessary. The foundry no longer can ignore its defects. Modern testing techniques do not permit them to. What is needed is further evaluation of defects with serviceability and cost as the prime considerations. Defects are not unique to castings. The foundry industry is fortunate that all of its defects are not the dangerous, cracklike ruptures peculiar to wrought metals.

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2. Holt, Marshall, "Some Factors Affecting Fatigue Strength of Aluminum Sand Castings," *Transactions*, AFS, Vol. 62 (1954), pp. 508-516.
3. Pellini, W. S., Brandt, F. A. and Layne, E. E., "Performance of Cast and Rolled Steels in Relation to the Problem of Brittle Fracture," *Transactions*, AFS, Vol. 61 (1953), pp. 243-262.

Fig. 8—Photographs of representative defects which did not result in significant decrease in bulge deformation. Cracklike defects specifically are excluded[3]

By HARRY ST. JOHN
Foundry Consultant

Pouring Practice in

The Brass Foundry

This is the fifth article in Mr. St. John's series on The Brass Foundry. Following articles on metal selection and melting, this section emphasizes the importance of proper preparation and pouring of molten metal

THE preparation of molten metal for pouring into molds and the pouring itself are as important as the melting operation. Metal which has been melted and brought to a suitable superheat is not ready for casting until the following things have been done.

1. Cleansing metal.
2. Cooling metal to desired pouring temperature.
3. Preparation of ladles, if they are to be used.

Pouring the metal into molds also calls for certain precautions and for the provision of facilities needed to carry out this operation with maximum efficiency and without injury to the quality of the metal.

In previous articles emphasis has been placed on the importance of selecting, preparing and melting metal with such care that molten metal from the furnaces is of top quality. Unfortunately, things don't always work out that way, and corrective measures become necessary. In any case, mechanical cleansing to remove dross and slag is an essential.

Treatment of the metal before it is taken to the molds includes some or all of the following steps: 1. Oxidation. 2. Desulphurization. 3. Deoxidation. 4. Degasification. 5. Skimming. 6. Temperature measurement. 7. Cooling.

In most cases, metal poured from the furnace already has been oxidized to avoid absorption of reducing gases. In fuel-fired furnaces, this step is provided for by suitable control of the combustion mixture. In electric furnaces there is no need for oxidation unless there has been water vapor in the furnace atmosphere or silicon contamination has occurred because of the presence of carbon. In such a case, oxidizing fluxes are useful. The mildest of these are black oxide of copper and manganese dioxide; they are commonly most effective in dealing with hydrogen absorption. Alkaline and alkaline-earth sulphates, such as sodium sulphate and barium sulphate, are particularly useful for the removal of traces of aluminum or silicon and for partial elimination of excessive iron. Sodium nitrate and potassium nitrate are more drastic in their action and usually are mixed with an inert substance like borax or chalk. Potassium permanganate is a strong oxidizing agent recommended for use with monel. Magnesium is a useful deoxidizer for many of the high-nickel alloys.

In the brasses and bronzes, soda ash sometimes is used as a desulphurizer, and manganese, such as manganese copper, is serviceable for the high-nickel alloys.

Most commercial fluxes contain one or another combination of the substances mentioned above. It should be borne in mind that habitual use of fluxes, like the habitual use of medical drugs, should not be necessary and can be dangerous. When needed they serve a useful purpose and their use, with knowledge and discrimination, is not to be condemned. But the more positive their action, the more certain they are to have undesirable effects.

One important consideration is that almost all fluxes tend to attack crucible walls and furnace linings, the life of which can be greatly shortened by their regular use in the furnace during melting. Yet fluxes are most effective if used in this manner since they need both time and high temperature to promote their action. This is particularly true in the indirect-arc furnace, where the flux floats on top of the metal, close to the heat of the arc and constantly is brought into contact with fresh quantities of untreated metal. For the same reasons, the destructive action of the flux on the lining is most pronounced in this type of furnace. On the other hand, if fluxes are used in the ladle

they are less likely to be effective unless the metal is poured from the furnace very hot and is allowed to cool slowly with occasional vigorous stirring, all of which consumes valuable time.

The subject of fluxes and the manner of their use will be discussed more fully in connection with the chemistry of the alloys we are dealing with and with the importance of the impurities commonly associated with them.

The process of oxidation which takes place during or after melting must be followed by deoxidation before the metal is ready for the molds. For the red metals, phosphor copper is the almost universal deoxidizer. This substance is in a class by itself, an addition agent rather than a flux. Its regular use, in moderation, is strongly recommended. In excess it tends to make the metal brittle and results in undue penetration into the sand or "burn-in." Black stains on castings are sometimes due to an excess of residual phosphorus which should not—except in the case of phosphor bronze—exceed 0.05 per cent. The usual dose is about 2 oz of 10 per cent phosphor-copper shot per 100 lb of metal. It should be vigorously stirred into the metal before final skimming or, if ladles are used, it is well to place it in the bottom of the empty ladle just before filling.

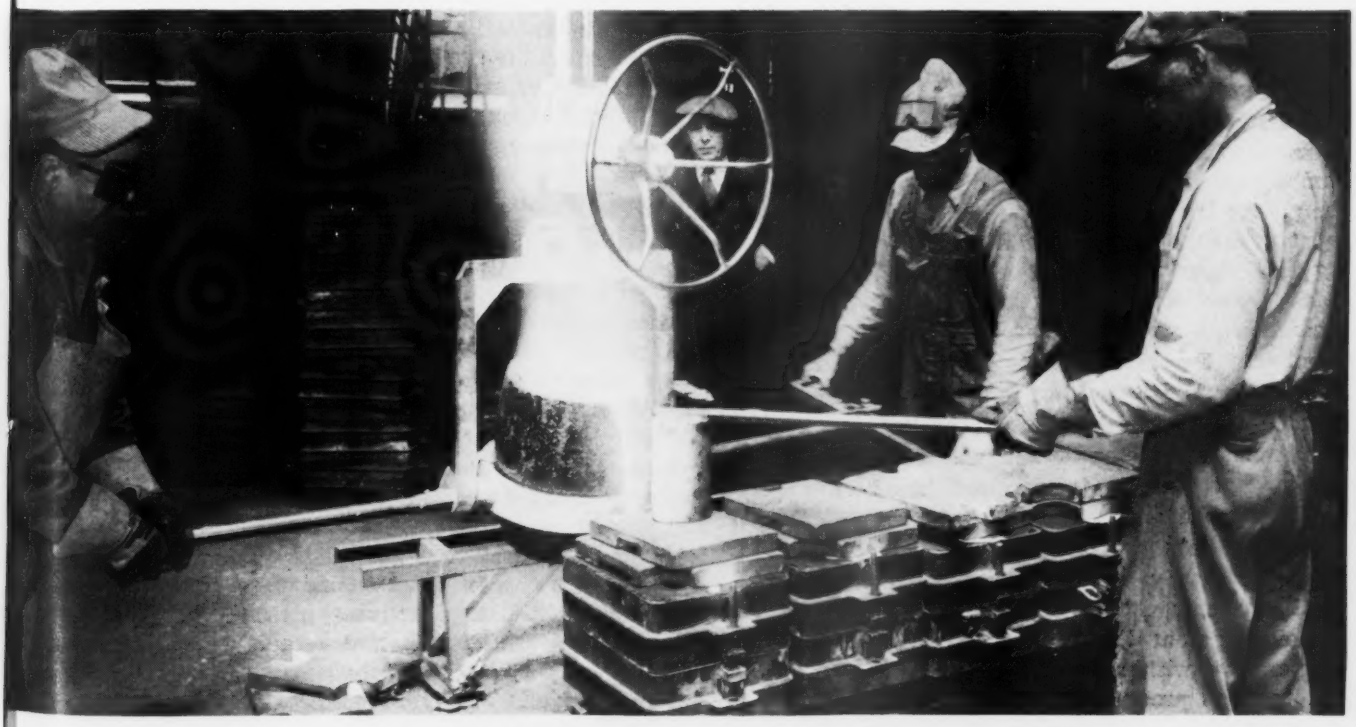
Other deoxidizers sometimes are used. Silicon, for example, is quite effective for monel, aluminum for some of the high-zinc alloys. Phosphorus, however, seems to have a distinct character of its own. Even when the metal is not particularly in need of deoxidation, the use of phosphorus is advantageous. Apparently the long solidification range of the red brasses and bronzes—of which more presently—is shortened by the presence of phosphorus. The metal seems to stay fluid longer and to feed better.

Brass or bronze as it comes from the furnace almost always contains some dissolved gas which will come out of solution as the metal cools. If it comes out in the mold, there is gas porosity in the castings, a condition especially probable in castings which require very hot pouring. If the metal is permitted to stand for some time in the crucible or ladle with occasional stirring, much gas is dissipated. This is good practice if the castings to be poured weigh 100 lb or more or if the casting section is unusually thick so that metal at the center of the section remains liquid long after the skin is solid.

The escape of gas can be accelerated by bubbling dry nitrogen gas through the molten metal for five or ten minutes. The use of nitrogen is worthwhile in the case of large castings which must meet severe requirements or, in any case, when there is reason to believe that the metal may be gassed. If, on the other hand, melting has been done in such a way as to avoid excessive gas absorption and large numbers of small castings which will freeze quickly are to be poured, gas porosity is not much of a problem and no special measures need be taken.

Some dross and slag is always present, floating on the metal as it comes from the furnaces. Removal of dross by skimming is an essential step in metal preparation. If there is liquid slag, a handful of molding sand will thicken it and facilitate complete removal. A small quantity of borax in the ladle before it is filled will agitate the metal and bring to the surface any dross clinging to the ladle walls. Vigorous stirring at this point also is

Preparation of molten metal for pouring into molds and the pouring itself are as important as the melting operation, if quality of the metal is not to be injured



helpful. Some nonferrous alloys have short freezing ranges. That is to say, they remain liquid as they cool until they reach a freezing point, at which point they become solid without much delay. This action normally results in a dense structure of small crystals closely interlaced. It applies in the high-zinc brasses and some of the high-nickel alloys, which consequently can be said not to be critical as to pouring temperature. With these alloys—manganese bronze, for example—a pyrometer scarcely is needed. It is only necessary to make sure that the metal really is hot.

Once again, we find that the high-copper alloys of zinc and tin are different. As they cool, a few crystals begin to form, and as the metal continues to cool, these sometimes grow to outsized dimensions before the metal is completely solid. This matter will be discussed more fully when we consider gating and risering. At the moment we are concerned with the fact that the red metals are exceedingly critical as to pouring temperature and that for them the pyrometer is essential.

A well-designed bronze or red brass casting has a pouring range of possibly as much as 150°F, not more. Each casting has its own particular range, depending upon composition of the alloy, design of the casting and design of the pattern or gating. Once the range has been determined—and that is quite a problem in its own right—it is highly important to pour every mold within that range. If we consider only the alloy 85-5-5-5 we find that, for different castings, the top pouring temperature may be as high as 2350° F, as low as 1950° F. Suppose we have a casting of good design with a top pouring temperature of 2240° F. This means that any mold poured above 2240° F or below 2090° F will yield an excessive number of rejects. Unfortunately, not all castings are well designed, from the foundry point of view, with the result that the foundryman commonly finds that he has to deal with a pouring range of 100° F or even less.

If there is only one mold to pour, the problem is quite simple. But in many cases, castings are so small that each mold takes only 10 to 15 lb of metal. Economy demands that a considerable number of molds be poured from each pot. If the pourer is spry it will take him about 8 seconds to pour each mold. Meanwhile the metal is cooling; the pouring range is wasting away. Brass in a crucible cools at the rate of about 1° F per second; in a well-preheated, well-insulated ladle, about 0.8° F per second. It appears then that if the casting has a pouring range of 120° F, only about 15 molds can be poured from one pot without encountering excessive scrap. And then only if the best starting temperature has been accurately planned and the actual temperature of the metal precisely controlled. A ladle designed to cool more slowly, without being so bulky as to be cumbersome, would ease the problem of control.

It is apparent that measurement of the metal temperature within a very few degrees is essential to good practice and that superheated metal

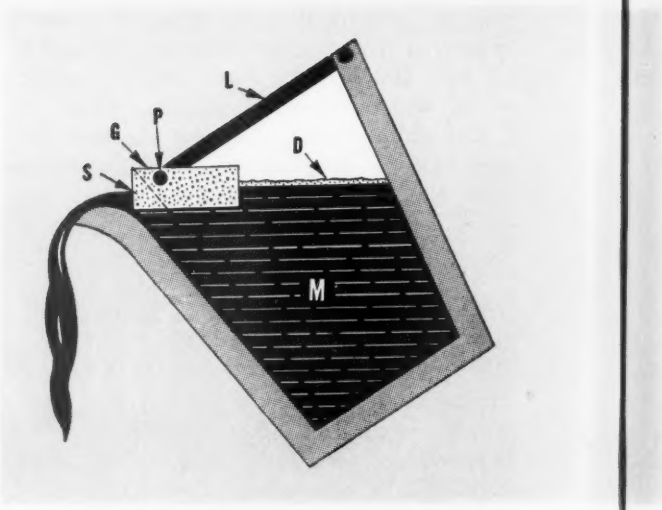


Fig. 1—Sketch of ladle with mechanical skimmer. M is metal, D is dross, G is graphite block, L is cover, P is pivot and S is slot

must be cooled to the desired point with great care. Pyrometers are available which make possible temperature readings in steps of 10° F, although the true accuracy of any individual reading is probably no better than plus or minus 10° F. The temperature of each pot of metal is usually measured at least twice, first to determine how much cooling is required and finally just before pouring. It is advisable to check pyrometers once or twice daily with a standard pyrometer known to be accurate. If it is found that the brass has been cooled below the desired starting point, the number of molds to be poured should be decreased.

It already has been mentioned that an ideal way to dissipate dissolved gas is to let the metal stand before pouring. This is also an ideal method of cooling, but it is too slow for a foundry which is trying to produce the maximum number of castings with the minimum number of manhours. Of course, sometimes the melter hits the desired temperature right on the nose but more often cooling by adding a gate or two is a time-saving expedient. Long experience has shown that this method of cooling is harmless, in spite of some published statements to the contrary. Again, as mentioned previously, letting the metal cool naturally is a good idea when one or more pots of metal are to be poured into a single large casting.

When metal has been melted in a lift-out crucible furnace, the crucible naturally used is for pouring into molds. For other types of furnaces, steel ladles lined with refractory are recommended. Crucibles are designed to have a high heat conductivity since a rapid flow of heat through the crucible wall from the fire to the metal is desired. During pouring this high conductivity results in undesirably rapid cooling of the metal and also subjects the pourer to a good deal of discomfort. A ladle lined with fire clay or one of several good commercial refractory mixtures presents a much cooler surface to the air and retains the metal temperature more efficiently. Ladle liners of crucible material often are used. These may be

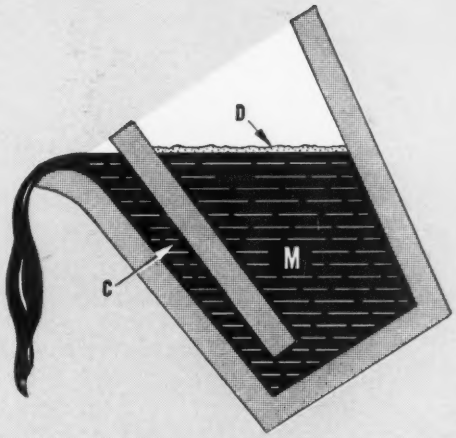


Fig. 2—Teapot ladle skims off slag, but it has disadvantages. In sketch, M is metal, D is dross and C the channel for molten metal

purchased already formed to fit most small ladle sizes. When installed with a layer of insulating material between the liner and the ladle shell, such ladles hold heat well and are somewhat easier to keep clean than fire-clay linings.

Freshly lined ladles must be thoroughly dried before use to get rid of our old enemy water vapor. Baking for 24 hours or more at 220° F is recommended when fire clay linings are used, but is not so necessary for crucible liners. Before actual use in pouring, all ladles, new or old, should be preheated with a gas or oil flame to a temperature approximately equalling that of the metal to be poured. Otherwise, the ladle will rob heat from the metal.

When a crucible or ladle is nearly empty, the metal is likely to become too cold for further pouring. Commonly the cold metal must be "pigged"—that is, poured into iron ingot molds for remelting later. This is a waste which may amount to 5 or 10 per cent of the metal delivered by the furnaces. When ladles are used, some of this waste can be avoided by filling the ladle only to the point which is expected to be needed for the line of molds to be poured. Even so a few pounds of metal are likely to be left at the end of the pour. If the ladle is to be used immediately for another pour, this residue can be salvaged by leaving it in the ladle when this is freshly filled from the furnace. Under best conditions, pigging should not exceed 2 per cent of the metal melted.

Not many years ago, a pouring crew usually was comprised of three men, the pourer, a shankman who assisted the pourer by steadying the other end of the shank, and a skimmer who used a hooked iron rod to push dross and slag away from the lip of the pot during pouring. Now best practice requires only one man, the pourer. The skimmer has been replaced by a mechanical device, which incidentally does a better job. The function of the shankman has been taken over either by the pourer himself or by what may be termed a mechanical shankman, in which a guide on a track engages the far end of the shank. It already has been pointed out that pouring, when a line of molds is involved, permits no lost time. A successful one-man pouring device for brass must be such that the pourer can index the lip of his ladle precisely over the sprue hole without hesitation.

One form of mechanical skimmer is illustrated in Fig. 1. An effective skimmer must be close to the inner surface of the pot so that metal can pour only through the slot in the skimmer block. The block must be mounted in such a way that it will always float on the metal, pivoting as the pot empties. The material of the block needs to be such that metal will not stick to it nor dross form upon it. Artificial graphite has proved most suitable. An older method of accomplishing the same purpose is the teapot ladle illustrated in Fig. 2. This ladle requires a special refractory construction which is rather difficult to maintain. It also has the disadvantage that crusts tend to form in the spout, break loose and float into the mold.

Both the mechanical skimmer and the mechanical shankman described above are patented and require a license for their use.

Careless Pouring—Carelessness may result in scrap castings, and often does. First, the pourer must move quickly from mold to mold if the expected number is to be poured before the metal becomes too cold. He must not spatter metal into the sprue hole before steady pouring starts, nor should he interrupt the pour before the mold is filled. If the internal design of the mold is as it should be, the flow of metal into the casting cavities will be under planned control provided the pourer pours just fast enough to keep the sprue hole level full. This precaution also serves to float at the top of the sprue foreign matter which otherwise might be carried into the mold.

If the pourer is to do a good job, the lip of his ladle must be centered squarely over the sprue hole before he starts to pour. It should be made easy for him to do this. The sprue hole should be located close to the edge of the mold, at the end or the side, as the construction of the pattern may require. With brass this arrangement is particularly important since the pouring stream should be short to avoid unnecessary exposure to the air and the possible inspiration of air in the stream. For this reason pattern layouts which place the sprue hole near the center of the mold, as is often done with cast iron, are quite unsuitable for brass.

The loss of metal by oxidation or volatilization during melting is a much discussed item of cost and is indeed an important one. However, it is only one of a number of losses which may take place during the passage of metal through the foundry. It is worth while to analyze what happens to 100 lb of metal delivered from metal storage to the furnaces. What part of the 100 lb finally winds up in the form of usable castings, and where is the rest of it? Step by step, what savings can be made? In the next article the writer will endeavor to throw some light on the practices responsible for the answers to these questions.

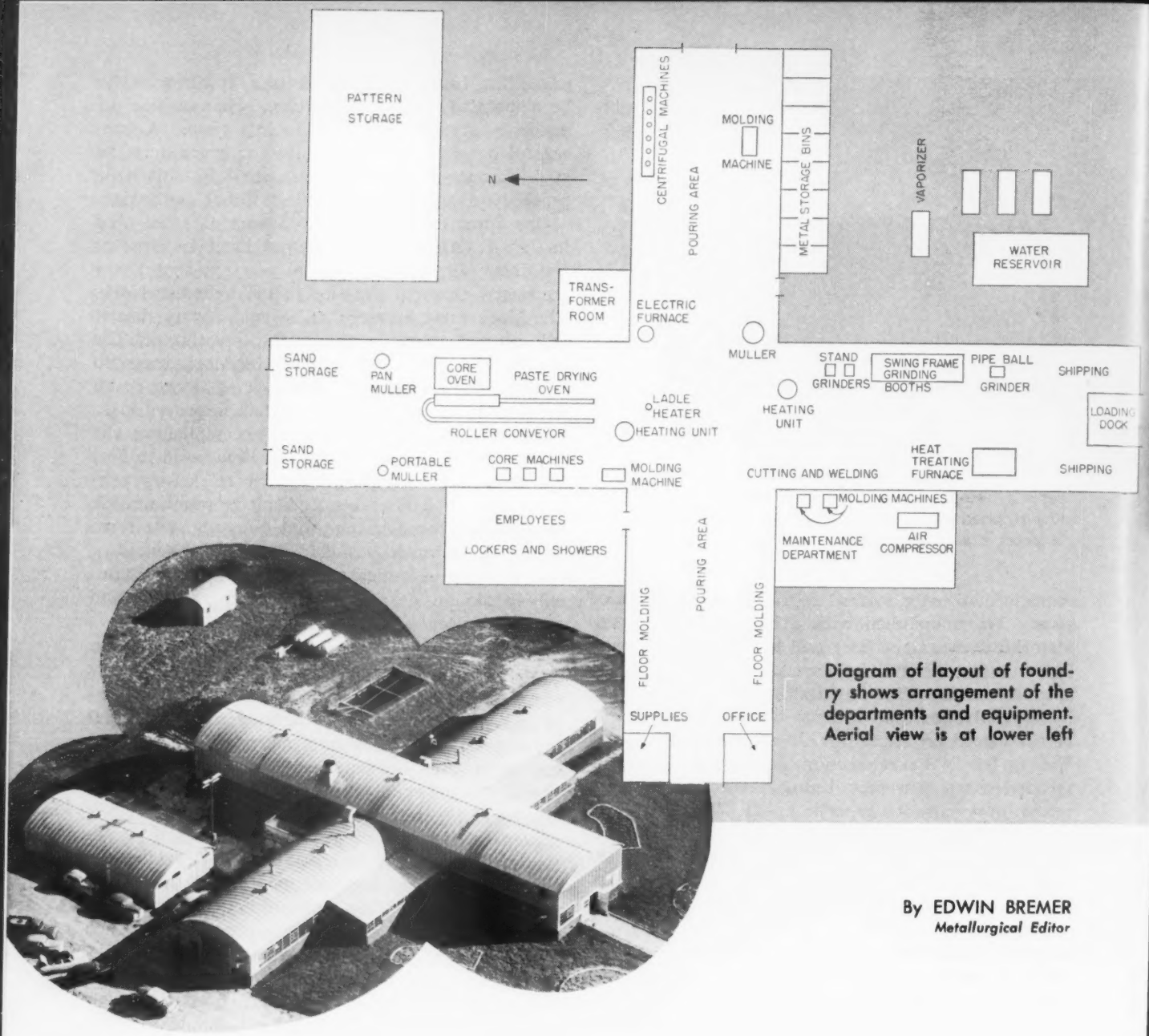


Diagram of layout of foundry shows arrangement of the departments and equipment. Aerial view is at lower left

Small Steel Foundry Produces Specialty Castings

By EDWIN BREMER
Metallurgical Editor

UNDOUBTEDLY one of the most unusual foundry floor plans is that of Waunakee Alloy Casting Corp., Waunakee, Wis. As shown in the accompanying illustrations, it is in the form of a cross. The main bay, 192 ft long, is intersected at its center by a bay 160 ft long.

Lower portion of the structure is reinforced concrete extending about 4 ft above the ground level. Upper part is formed of steel panels incorporating numerous steel window sash to provide as much natural illumination as possible. This is supplemented, when required, by numerous incandescent lights located just below the roof supporting trusses. Roof is semicircular, and insulated. Winter heating is supplied by two propane-gas-fired unit-type space heaters mounted a short distance below the roof.

Waunakee Alloy Casting Corp. is a producer of proprietary high-alloy wear and heat resisting steel castings for hot working applications in steel mills. Castings include rolling mill guides and rollers for bar, hoop, strips and shapes; guide shoes, mill

Fig. 1—Company produces some castings in core molds. Here they receive a refractory coating

Fig. 2—Core molds are made on jolt rockover machines with pattern draw. Oil-sand mix is used

plugs and rolls, and piercer points for seamless tube mills; forming and planishing rolls and tool holders for electric-weld tube mills; straightening machine guides and similar types of wear and heat resisting castings. Some of the various castings are shown in Fig. 8. Castings weigh from 1 to 1000 lb and are shipped in the as-cast, annealed, and quenched and drawn condition according to the properties desired.

The firm was organized by Jack Trantin Jr., president, Youngstown Alloy Casting Co., Youngstown, O., late in 1953 to provide more rapid delivery of these specialty castings to steel mills in the Chicago-Milwaukee area. Waunakee is approximately 160 miles from Gary, Ind., and only half that distance from Milwaukee. First heat in the foundry was poured on Apr. 8, 1954, and present production is about 4000 lb a day.

Mention of the cross-shaped layout of the foundry undoubtedly raises the question of efficient functioning in a continuously forward movement of incoming raw material to outgoing finished product. Inspection of the accompanying floor plan, will show that it fully meets that concept. The core department in the north wing forwards cores to the central area for distribution to molds in the east and west wings. This department also produces and assembles core molds which are moved in the east wing and placed on the floor or in centrifugal casting machines for pouring. Green sand molds are made on machines or by hand on the floor in the west wing.

After pouring, the castings are shaken out and transported into the south wing where they are cleaned and the risers and gates cut off. Cutting of high-chrome and other high-alloy steels is done by the electric arc, and in the case of plain carbon and low-alloy steels the gates and risers are cut off by oxyacetylene torches. Castings are inspected, ground, heat-treated, given a final in-

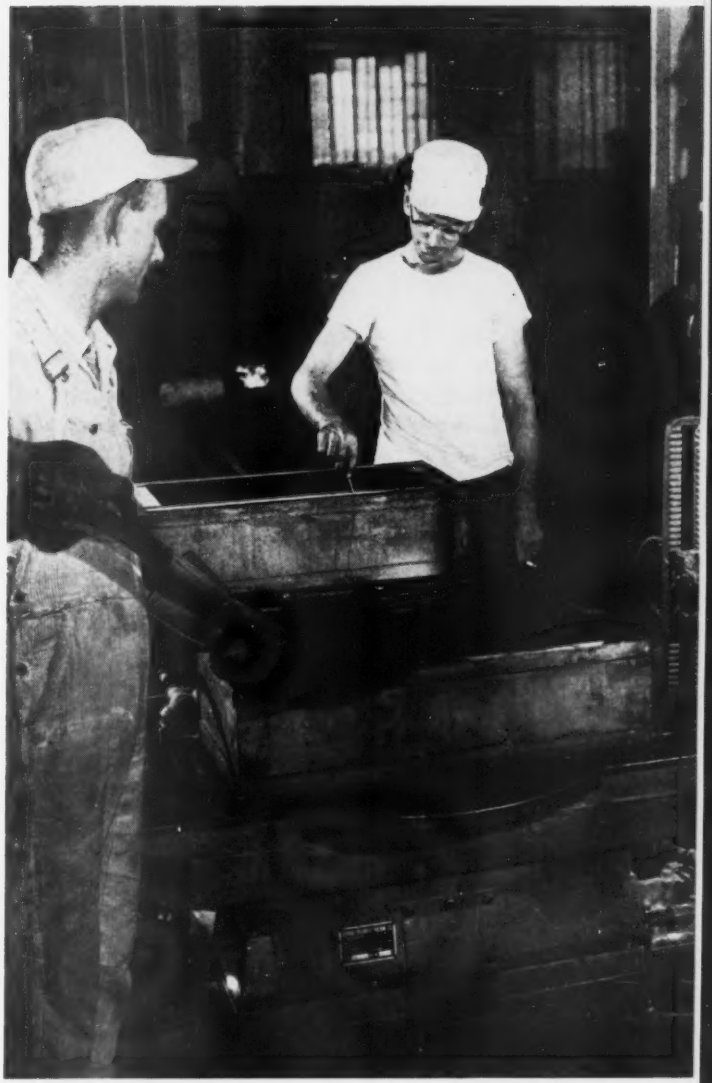


Fig. 3—Green sand molds are made both by machines, as shown here, and by hand on the floor

Fig. 4—Steel is melted in a 1000-lb direct-arc electric furnace and tapped in lip-pour ladles

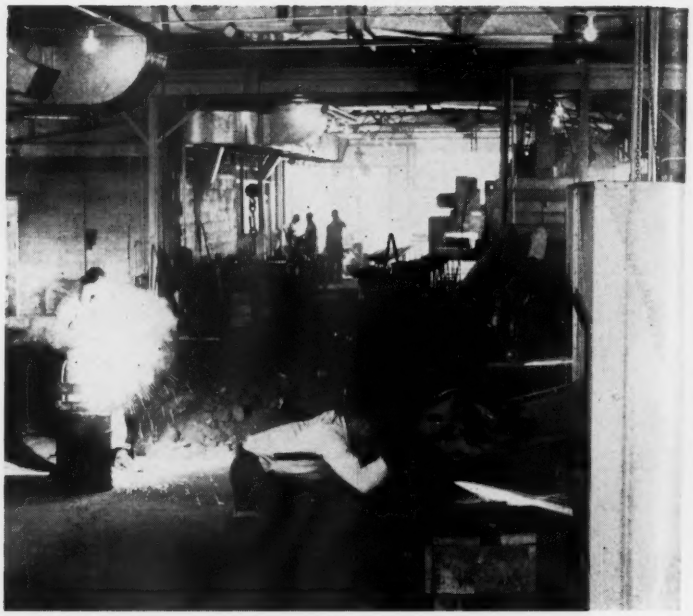


Fig. 5—Part of cleaning department. Gates are burned off at left; grinding is done at right

Fig. 6—Booth which partially encloses swing-frame grinder is equipped with powerful exhaust

spection, and then placed in the shipping department at the end of the south wing.

Core department in the north wing is equipped with a 7 x 13 x 6-ft core oven having doors at each end. Oven is recirculatory type heated with liquid propane gas. Sand used is washed and dried Portage silica of about 50 AFS grain fineness. Mixed with 1½ per cent core oil and 1½ per cent corn flour in either a portable type sand muller of capacity of 200 lb or a revolving pan muller of 500-lb capacity, the sand is formed into cores or core molds on the bench or on jolt rockover machines. Cores and molds are placed on racks which, when filled, are moved into the oven at the rear. After baking, the cores and molds are removed at the front of the oven. Cooled cores are distributed to the molding areas or stored. Core molds are placed on a roller conveyor, sprayed with a zircon flour wash, pasted and assembled, and then sent through a paste drying oven. After drying, the molds are placed on the floor or in centrifugal casting machines in the east wing for pouring.

Green sand molding is performed in the west wing and a section of the east wing on machines (Fig. 3) or by hand on the floor. Practice followed depends upon casting size and pattern equipment. Usually small and medium size castings which are in reasonable demand are arranged for molding machine production. Large castings and those which have low demand are produced by hand molding on the floor.

Sand for green sand work is the same washed and dried silica type used for cores. It is mixed with about 1½ per cent cereal, 1½ per cent western bentonite and 3 per cent water in a sand muller of 1000 lb capacity.

Steel for the castings is melted in a 1000-lb capacity direct arc electric furnace. A wide variety of high-alloy composition is produced. Composition will depend upon the application of the casting and includes a number of proprietary alloy steels to withstand severe heat and wear conditions; these are sold under the tradename Trantinyl. Molten steel is handled in lip-pour ladles transported by

Fig. 7 (left)—Closeup of swing-frame grinder operation on a heavy casting

Fig. 8—After cleaning and grinding, all castings are given a careful inspection

a 5-ton capacity crane spanning the east and west wings of the foundry.

After the molds are poured the castings are shaken out. Time of shakeout will depend upon the form of the castings and its composition. In some cases the castings are partially or completely shaken out as soon as they have solidified. This applies usually where the shape of the casting or the composition of the steel exhibits a tendency toward tearing. Other castings are allowed to cool in the molds to a safe handling temperature before shaking out. Castings are moved into the cleaning department in the south wing. Sand from the core molds is loaded into a truck at the end of the east bay and used as fill in the low areas of the foundry property, which occupies six acres. Molding sand is transported to the sand mullers for reconditioning.

In the cleaning department the gates and risers are removed with electric arc or oxyacetylene torches and then inspected. Gate and riser stubs and other surface imperfections are ground off. Small castings are ground on stand grinders or with flexible shaft grinders. With heavy castings swing-frame grinding is employed, followed by flexible shaft grinding where required. To eliminate any possible dust hazard in operation of the swing-frame grinder the major portion of it is enclosed in a booth which is ventilated by a powerful exhaust fan.

Following the grinding operations the castings are heat treated in an oil-fired furnace 6 x 11 x 4 ft. Procedure employed depends on the casting and its composition. As mentioned earlier some castings are simply annealed by heating from 1400 to 1500° F, and allowed to cool slowly in the furnace. Others are heated to 1650 to 1900° F, quenched, and then drawn or tempered at 800 to 900° F. After heat treatment the castings are given a final inspection and placed in the adjoining shipping department.

Patterns not in active use in the foundry are stored in a separate structure adjacent to the foundry proper. It is 30 x 60 ft and, like the foundry, is constructed of currugated sheet steel panels. Steel shelving along the four walls and in the center provides adequate and safe storage for the patterns.

Impurities In Copper-Base Alloys

Surveying the effects, detection and removal of impurities in copper-base alloys, the author not only has examined the literature on the subject, but also has incorporated data sent in by nearly 100 foundries and smelters

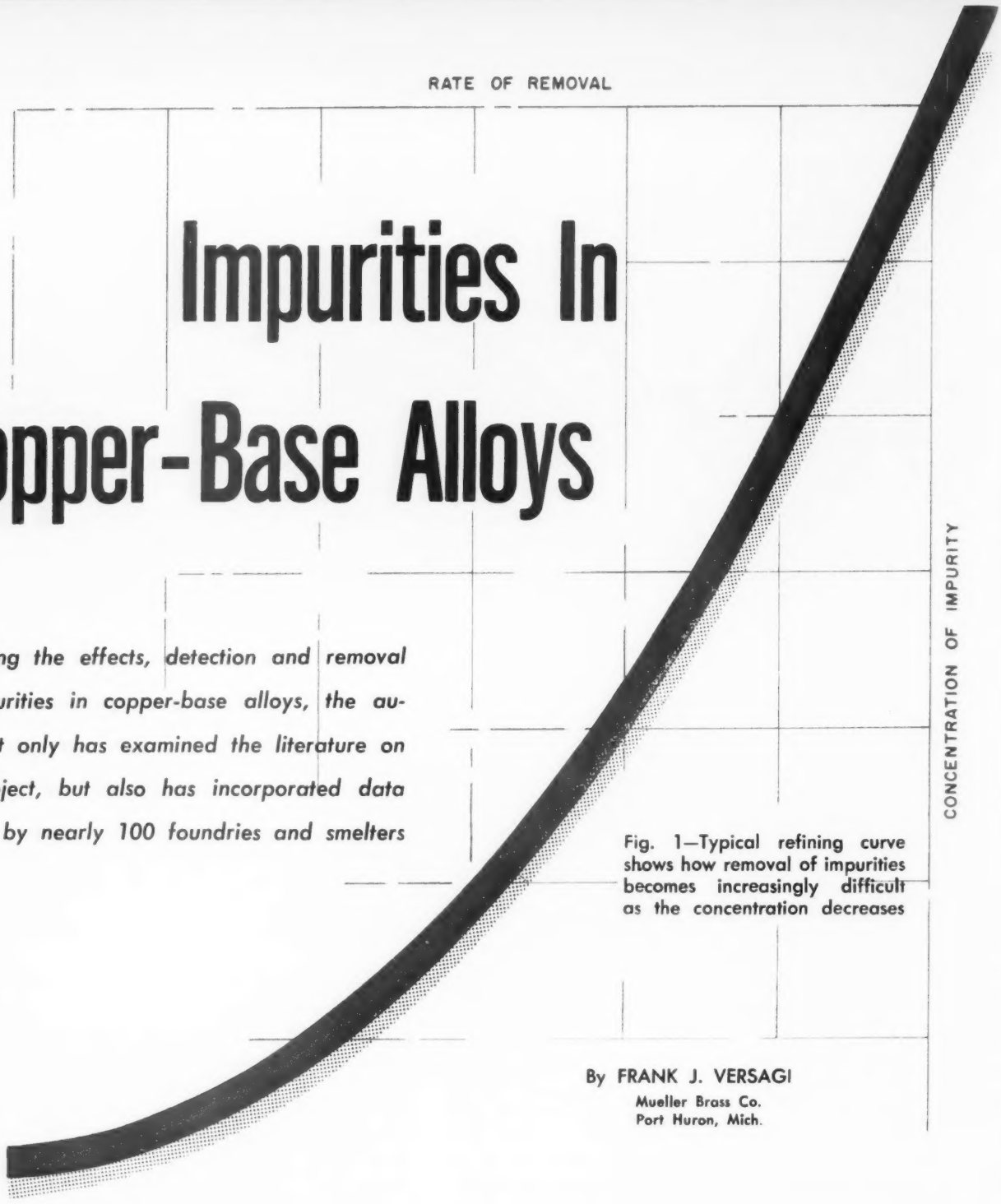


Fig. 1—Typical refining curve shows how removal of impurities becomes increasingly difficult as the concentration decreases

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AN EXTENSIVE review of the literature revealed that, compared to the literature available in the ferrous field, the information available on impurities in copper-base alloys is very sparse, especially with reference to refining practices. This sparseness is, unfortunately, more pronounced in American than in foreign literature. Several articles were found dealing with the general subject of producing quality copper and copper base alloys.[2, 5, 9, 13, 14, 15, 31] However, it was readily apparent that the literature does not accurately reflect common refining practices.

A survey questionnaire was therefore sent to brass foundries and brass ingot makers throughout the United States and Canada to determine, if possible, actual refining practices. Sixty-five per cent of the questionnaires were returned, and the data are incorporated into this article. (See list of co-operating firms at end of article.)

The specific details gathered in the survey will be presented in their appropriate places. Three general points became obvious as the submitted data were studied.

1. Of the few refining procedures described in the literature, only a small percentage have been adopted or even tested. Some of the most glowingly described refining practices in the literature have either been tried and found wanting, or have never been tried at all.

2. Although there are several refining procedures which have become common to the industry, the general tendency is for each firm to have

a pet flux mixture or technique which is used for the removal of almost all the impurities.

3. Only a very few foundries do their own refining; they depend on the supply of quality ingot. Those which do refine use crucible or open-flame furnaces. One foundry reported the use of a small reverberatory furnace. (A report on the use of reverberatory furnaces in the foundry was found during the literature study.[47])

This last point would indicate that the information gathered in this article will be of immediate interest to the ingot makers, although its ultimate value to foundries is also obvious.

After a brief review of general refining procedures, this article will cover in alphabetical order the common impurities in copper base alloys, and will deal with the effect, the detection, and the removal of each.

General Refining Practice—In the refining of an ore, the desired result is the separation of the undesirable portion or gangue from the useful material. This gangue usually exceeds in concentration the desirable component sought.

In the case of copper-base alloys, however, the concentration of the individual impurity to be removed is frequently less than 0.5 per cent, as in the case of iron; it is quite often less than 0.01 per cent, as in the case of aluminum. It is an unfortunate fact that the lower the concentration of an impurity, the more difficult becomes its removal by any means. (Fig. 1) Thus, to reduce aluminum from 0.02 per cent to 0.01 per cent is much easier than to lower it from 0.01 per cent to 0.005 per cent.

Fluxes—Common to most refining is the use of fluxes. In ore refining the primary function of the flux is to lower the melting point of the gangue and to form a slag which will rise to the top of the metal bath where it may be skimmed off or left in the furnace as the metal is tapped from beneath it.

In refining copper-base alloys, it is more important that the flux supply the necessary chemical substance to react with the impurity in question. The complex compounds formed by this chemical reaction must form a fusible slag with the remainder of the flux to facilitate subsequent removal.

In foundries equipped only with crucible furnaces or with electric furnaces which transfer metal into pouring crucibles, fluxing is usually the only refining technique applicable, and some of the reports in the literature describe general refining actions of this nature.[19, 21, 22, 24, 27, 38]

Fluxes are of three types—acid, basic, neutral.

The primary acid flux is silica or sand, SiO_2, which reacts with basic substances to form a silicate slag.

The common basic fluxes are lime (CaO), iron oxide, either red (Fe_2O_3) or magnetic (Fe_3O_4), and soda ash or sodium carbonate (Na_2CO_3). These fluxes, of course, react with acidic substances to form slags.

The most common neutral flux is borax, $Na_2B_4O_7$. Also frequently used is fluorspar, CaF_2. The neutral fluxes are used for refining impurities where there is little slag forming material, and it is desirable to form some fusible slag to absorb the impurities. For this reason borax is often a component of a flux mixture used in various refining procedures for copper-base alloys.

Oxidizing fluxes such as sodium sulphate or niter might be considered a fourth type of flux, their purpose being to supply oxygen for those refining procedures which call for the oxidation of impurities.

It must be remembered that the use of a flux for refining requires intimate contact between the metal and the flux. Using a molten cover of glass over metal is not refining. The minimum requirement in a crucible, for example, would be to stir the flux and metals for a few minutes, then allow the slag to rise and be skimmed off.

The refining action of a flux is termed dry chemistry because no water solutions, so common to normal chemistry, are involved in the chemical reactions. In order for the dry chemistry to proceed efficiently, the flux must be molten. Silica sand, for example, has a melting point of about 2900° F. In a bath of metal at 2200° F, its refining efficiency would be very slight. On the other hand, an intimate mixture of 75 per cent silica and 25 per cent lime has a melting point in the vicinity of 2100° F and forms a useable flux.

This lowering of melting point is another of the reasons that many of the refining actions to be described call for compound fluxes, even though only one of the components may take part in the dry chemistry involved.

Theoretical considerations and practical applications of fluxing and slagging may be found in the general texts on metallurgy[30, 35, 36, 37] and in the work by Lepp.[26]

Air—Air is used extensively for refining copper-base alloys, sometimes alone, sometimes in conjunction with fluxes. Air refining is usually conducted in reverberatory or rotary type furnaces, although the survey showed that a few foundries use air refining in crucible furnaces.

The bubbling of air through a molten bath of metal serves both to oxidize the impurities and to intimately mix and agitate the metal, bringing all of the metal into contact with the air or whatever flux is being used simultaneously. Theoretically, pure oxygen might seem more efficient than air. Glassenberg, Mondolfo, and Hesse[18] experimented with oxygen but the field survey showed not one of the contributing firms using oxygen in place of air.

Air can be supplied either from purchased cylinders or by compressor. The survey showed an overwhelming preference for compressor-supplied air.

The moisture, and/or dirt, and/or oil to be found to a certain degree in most compressor airs can cause difficulties in copper-base alloys because of the introduction of steam or reducing gases. Therefore, many contributors reported the use

of filters or driers in their air lines. Several types of filters and condensers or driers are commercially available for this purpose.

Coupled to the rigid pipe from the compressor is a pressure rated rubber or other flexible tube at the end of which is the injection tube which is inserted into the furnace or crucible. Although the literature warns of the danger of iron contamination by contact of molten brass with iron or steel in ladles, stirring bars and the like,[18, 19, 40] in actual practice heavy walled iron pipe is the universal material used for air injection.

Silicon carbide, graphite and ceramic type tubes have been recommended, but only one contributor stated that he uses carbon injection tubes in daily practice. Experience has generally shown that nonmetallic pipes are too fragile to withstand the rough treatment they must necessarily receive.

The amount of air required to accomplish a specific refining task depends, of course, on the size of the metal bath and the amount of impurity or impurities to be removed. Normally, air under 20 to 40 lb pressure is introduced under the surface of the molten bath through iron pipe ranging from ½ to 1¼-in. in diameter. Exceptions to this general range were two contributors who reported the use of 70-lb pressure with a ¾-in. pipe and 80-lb pressure through a ½-in. pipe. At the other extreme, a foundry reported the use of 5 to 10 lb pressure through a ½-in pipe.

Except in such experimental work as described by Glassenberg et al,[18] the amount of air used to accomplish a specific refining task is usually specified by pressure and length of time. For example, to reduce iron in brass from 0.50 per cent to 0.35 per cent might require 5 minutes of air at 10-lb pressure in a 200-lb crucible. To accomplish this same degree of refining in a large reverberatory furnace might require a 45-minute "blow" at 30-lb air pressure.

As might be expected, the most efficient refining is accomplished by the joint use of specific fluxes and air, and this combination is used with only a few exceptions throughout the industry. As explained earlier, the air, besides introducing its own refining action, serves to intimately mix the flux and the metal, thus speeding the chemical reaction between the flux and the impurities.

Poling—Although the use of green poles is no longer common, several firms reported the use of poles in certain refining procedures. Essentially the use of poles in a molten bath produces reducing gases, useful in removing oxides and oxygen (See sections on Tin and Gases); the poles also serve to produce great agitation which serves to speed any refining action taking place.

General Effects of Refining—It must be kept in mind that refining procedures generally are not selective. While refining for aluminum, for example, iron, silicon, and manganese—if present—will be simultaneously removed, although at different rates. When using air alone as the refining medium, Glassenberg et al[18] found that the common impurities were removed in the following order: Aluminum, manganese, silicon, phosphorus and iron. This does not mean that all the aluminum is removed before the other elements begin to come out; it means that the aluminum is removed at the highest rate, with the others following in order.

The field survey revealed that the industry is aware of this fact. In many cases the same flux mixtures and refining processes are reported for several of the common impurities. Unfortunately, however, no accurate information on actual rates of removal is available from the field.

To a lesser degree, alloying elements, as well as impurities, are removed during refining. Thus, during air refining for any or all of the above impurities there is a considerable zinc loss. The amount of loss varies with the alloy, the loss decreasing as the concentration of zinc decreases. This follows logically from the statement made earlier as to the decrease in the rate of removal of impurities as their concentration is lowered. In high-tin, high-lead-bearing bronzes, where zinc is an impurity and not an alloying element, it is quite difficult to remove the last few tenths of a per cent.

Of course, where zinc is an alloying element it must be replaced after refining. Fortunately, zinc is in itself a good deoxidizer, and its addition after air injection serves both to replace the lost zinc and to deoxidize the metal.

The effect of all refining practices on refractories must be considered. Generally, a basic refractory should be used where a basic slag is to be developed, and an acid refractory where an acid slag will form. This is not always possible and several types of refractories are used in the field, with each firm basing its choice on its own previous experience. Swain[45] describes various fundamental tests which may aid in the choice of the best refractory for a given purpose.

With this brief review of refining procedure, we shall begin our discussion of the individual impurities.

ALUMINUM

Effect—Although added as a strengthening material in aluminum, manganese and silicon bronzes, aluminum as an impurity is generally considered the most detrimental of impurities to be commonly found in copper-base alloys. The specifications limit aluminum to 0.005 per cent when determined on a 10-gram sample. The reason for the stipulation of sample size is that in ordinary brass and bronze analysis, using smaller sample sizes, aluminum in this order of concentration would not be detected.

The harmful effect of aluminum is due primarily to the formation of a tough skin of aluminum oxide. This oxide skin greatly reduces fluidity, causing shrinkage porosity and inclusions. Further, aluminum contamination reduces strength and

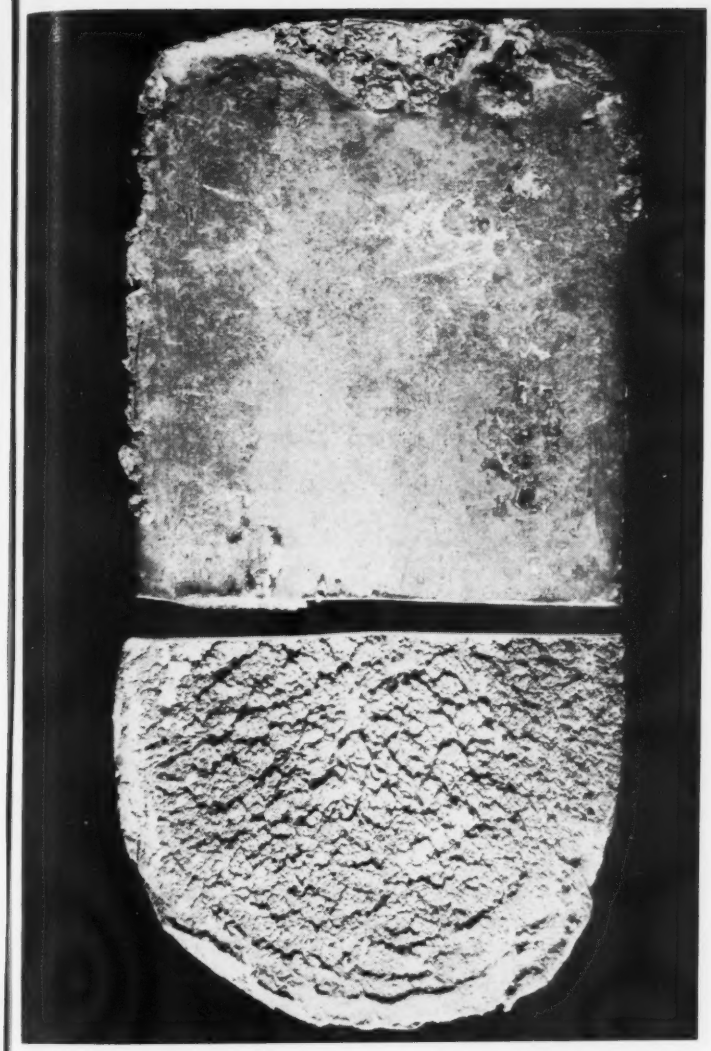

Fig. 2—Ingot was poured from 85-5-5-5 alloy with 1/10th of 1 per cent Al added. Skin of aluminum oxide prevented normal formation of surface oxide

elongation. In lead-bearing alloys aluminum causes lead sweating and unsoundness.[19, 32, 43]

Dramatic evidence of the power of the aluminum oxide film is seen in Fig. 2. One-tenth of 1 per cent aluminum was added to a heat of 85-5-5-5 type metal and an ingot poured. The aluminum oxide skin prevented the normal formation of surface oxides, which are the distinguishing characteristics of a rough-top ingot. The aluminum-bearing ingot has the appearance of a smooth top ingot.

Detection—Fortunately, the presence of aluminum is easily detected in the molten bath. The oxide skin casts a silvery sheen over the molten surface. When the metal is poured, the stream of metal is silver white. If the aluminum concentration is sufficiently high, the solidified castings will also have an easily discernible silvery cast unlike normal brass or bronze appearance. In the case of leaded alloys, portions of the casting surface will be rich in lead due to the lead sweat caused by the aluminum.

Quantitative chemical determination of the small amounts of aluminum needed to reject a metal is difficult to accomplish. Most of the classical methods found in the chemical texts are more readily applicable to aluminum concentrations in excess of 0.1 per cent. In lower concentrations instrumental methods are needed. Spectrographic, photometric, and polarographic methods are applicable, the latter two requiring preliminary chemical separation and isolation of the aluminum.

Refining—The removal of aluminum by oxidation may be accomplished by air[18] or by the use of oxidizing fluxes such as potassium sulfate, copper oxide or manganese oxide.[19, 21, 22]

Glassenberg et al[18] were able to reduce aluminum from 0.07 per cent to 0.01 per cent by the use of air alone. Hanson and Pell-Walpole[19] were able to reduce the aluminum content of bronze from 0.10 per cent to 0.002 per cent by melting under a flux containing 33 per cent copper oxide, 33 per cent sand, and 33 per cent borax.

A mixture of chlorides and a mixture of oxides and chlorides are also described as capable of removing aluminum.[19]

The use of fluoride-bearing fluxes is described by Larsson and Lofgren[22] and by Schneider and Schmidt.[38]

Experience in this country seems both to make use of and neglect the information contained in the literature. Because of the importance of aluminum removal to the ingot maker and the foundry, Table I has been prepared. The table presents the actual refining practices for aluminum according to major types. It must be understood that there are variations of each practice. Cooperating firms were asked to remark on the effectiveness of their refining procedures. While most of the firms considered their methods effective, it may be significant that each of the firms using chloride-bearing fluxes reported "very effective" removal of aluminum.

In all cases air was used in addition to the fluxes.

ANTIMONY

Effect—Antimony is not considered an especially harmful impurity and the various specifications differ in allowable content. In general a maximum of 0.05 per cent is specified for high-tin bronzes, while a maximum of 0.5 per cent is allowed in high-lead bronzes. In the intermediate group, such as 85-5-5-5, the limit varies from 0.25 to 0.35 per cent.

When present in excess, antimony tends to embrittle copper-base alloys and to exercise a generally weakening effect.[19, 43] It is not a serious contaminant because of the relative ease of sorting high-antimony scrap prior to any remelting or smelting procedures.

Detection—There is no proved method for recognizing antimony in the molten bath. The most rapid of the chemical methods of detection consists of dissolving about 1 gram of the copper-base alloy in nitric acid, diluting to about 50 cc

with distilled water, and filtering off the white precipitate which will form if any tin and/or antimony is present.

The white precipitate is then dissolved in hot hydrochloric acid. One drop of the resulting solution is placed on a dime and a piece of pure tin shot is brought into contact with the drop. In a minute a black spot will discolor the dime if antimony is present. (The money is not permanently defaced so no law is broken!)

Quantitative determination of antimony is accomplished by any of several standard methods available.

Refining—Theoretically, antimony can be removed by oxidation. In practice the removal of antimony below approximately 0.35 per cent is not practicable.

Hanson and Pell-Walpole[19] report success in reducing antimony from 0.34 per cent to 0.29 per cent by melting under a flux containing 50 per cent copper oxide, 25 per cent sand, and 25 per cent borax. Glassenberg et al,[18] on the other hand, report no removal of antimony from an alloy containing 0.12 per cent either with air or oxygen. Hillebrand, Poull, and Kenney[20] report the furnace removal of antimony from copper by blowing with air until the metal contains about 1 per cent oxygen, then blowing powdered soda ash through the melt to dissolve the antimony compounds.

None of the contributors listed refining procedures for antimony. All depended on prior separation of scrap or dilution if antimony was excessively present in the bath.

IRON

Effect—Iron is easily the most common impurity in copper-base alloys. Although added to silicon, aluminum and manganese bronzes as a strengthening material, iron as an impurity in other copper-base alloys is undesirable. The maximum allowable concentration varies from 0.15 per cent in high-tin, high-lead alloys to 0.30 per cent in red brasses and to 0.50 per cent in yellow brasses. One specification[1] permits 0.75 per cent iron in certain yellow brasses.

In copper-base alloys iron goes into solution up to 0.2 per cent. In excess of this concentration, iron-tin compounds form, and the appearance of free iron particles becomes probable. As an impurity iron tends to form hard spots which cause machining difficulties. In addition, iron causes a severe weakening and embrittling effect. It also serves to impair fluidity and to reduce resistance to corrosion.

Detection—Unfortunately, for so common an impurity, it is not possible to detect visually the presence of iron in molten brass. Old timers who claim to the able to "see" the iron are usually unconsciously basing their estimate upon the type of charge they saw go into the heat.

In extreme cases, where machine tools have actually broken, it is possible to see small spots of imbedded iron in the brass castings.

TABLE I—Reported Refining Procedures for Aluminum in Copper-Base Alloys

Flux	% Flux in Melt	Temperature °F
40% Borax 58% Sand 2% Fluorspar	2–4	2100–2300
45% Glass 45% Salt 10% Soda ash	3–5	1900–2100
Sand Soda ash Lime	1	2000
Powdered glass	1	2100
Lime	1	2100–2200
40% Limestone 40% Sand 20% Soda ash	1	1900
Soda ash 75% Blast furnace slag	4 times estimated Al	1950
25% Sand	5	2100
Borax*	cover	2200–2300
Salt	0.5–1	2100

*Remarked this method is slow

In cases where iron contamination is suspected but not so obvious as above, immersing a machined surface or a slab from an ingot in a 10 per cent solution of ordinary table salt in cold tap water will, after several hours or overnight, reveal isolated rust spots if free iron particles are present in the alloy.

Even though no free iron is detected, there may be excess iron in actual solution or compound form in the brass. The amount of such iron may be determined in less than ten minutes by the rapid method reported by Sherman.[39] This very excellent method is invaluable in the control of heats before they are poured.

Refining—Iron may be removed by oxidation using fluxes, air, oxygen or combinations of these.[18, 19, 44] To gather the iron oxide and facilitate slagging, siliceous fluxes are used.[17, 23, 34, 44] The silica combines with the oxidized iron to form silicate slags.

The field survey revealed that the basic reactions described above have been incorporated into many refining procedures. Table II summarizes the common refining procedures reported for iron. Air is used in all cases, both as an oxidizing agent and as the means of agitation.

LEAD

Effect—There is contradiction in the literature as to the adverse effect of lead when present in tin or zinc bronzes. The contradictions seem to be due to a lack of standardized casting conditions. Lead is considered an impurity in high-tensile manganese and silicon bronzes.[19]

Detection—The simultaneous detection and determination of lead may be accomplished by the standard method of electrolysis. If lead is present, brown lead peroxide will plate on the anode and may be subsequently dried and weighed.

TABLE II—Reported Refining Procedures for Iron in Copper-Base Alloys

Flux	% Flux in Melt	Temperature °F
Sand	0.5	2100
50% Sand 50% Sodium nitrate 25% Sodium sulphate 25% Soda ash	1	2100
50% Borax 75% Blast furnace slag	2 times estimated Fe	2100
25% Sand	5	2100
Sodium nitrate	0.5	2050–2150
57% Sand 26% Limestone 17% Soda ash*	1	1900
50% Caustic soda 50% Borax	5	2100–2250
70% Powdered glass 30% Lime	3	2100–2300
50% Glass 50% Iron oxide*	2–4	2100
40% Borax 60% Sand*	2–4	2100–2300

*Listed as very effective

Refining—Glassenberg et al[18] reported no reduction of lead content upon blowing with either air or oxygen. Hanson and Pell-Walpole[19] reported the lowering of lead from 0.76 per cent to 0.31 per cent by the use of a flux composed of 50 per cent copper oxide, 25 per cent sand and 25 per cent borax.

None of the returned questionnaires described any refining procedures for lead. Dilution was reported as the only method of reducing the relative lead content of a melt.

NICKEL

Effect—As an impurity nickel is without detrimental effect. As an alloying element it is added in concentrations to 2 per cent, and it serves the useful purpose of narrowing the freezing range, thus allowing a greater range of casting temperatures. Further, in the high-lead bronzes, nickel tends to refine the grain, thus decreasing the segregation of lead. Because of its property of increasing corrosion resistance, strength and whiteness, nickel is added in amounts up to 15 per cent in some brasses.

In the United States specifications limit nickel to 0.5 per cent and 0.75 per cent in red brasses and high-tin or high-lead bronzes. In England nickel is added in concentrations of 1-2 per cent with the intent of increasing the wear resistance and resistance to pounding of leaded bearing bronzes.

Above 2 per cent nickel appears to decrease the fluidity of brass slightly.

Detection—Nickel cannot be visually detected in the molten bath or in the casting. The most positive test for nickel is the red precipitate which forms when an ammoniacal solution containing nickel is treated with dimethylgloxime. The procedure for this test and its adaption to quantitative determination may be found in any text on analytical chemistry.

Refining—The author was unable to locate any literature describing the removal of nickel from copper-base alloys. Glassenberg et al[18] were unable to remove nickel by oxidation.

In the field survey no refining process for nickel was reported. As in the case of antimony and lead, the nickel content is controlled by previous segregation of the charge or by dilution.

PHOSPHORUS

Effect—The effect of excess phosphorus in sand castings is familiar to most brass foundries. Although commonly added to deoxidize the metal and to increase fluidity, excess phosphorus causes the metal to become excessively fluid and to penetrate into the core or molding sand. In addition, excess phosphorus causes a slight embrittlement.[19, 32]

In practice, just a bit more phosphorus than is necessary for deoxidation is added to improve hardness and wear resistance, especially in chill castings.

Maximum concentrations of phosphorus vary from 0.03 to 0.05 per cent in the red brasses, while some specifications allow as much as 0.25 per cent in gun metals.

Detection—Several foundrymen report the ability to determine by the change in the appearance of the surface of the molten bath just when enough phosphorus (usually as phos-copper) has been added to deoxidize the metal. There was mention of an article describing this visual type of control, but the author was unable to locate such an article.

The great majority of foundries make a definite phosphorus addition to each unit weight of metal, often whether the metal needs the addition or not. This practice frequently leads to a phosphorus buildup since previously deoxidized gates and risers are also charged into the melt.

If phosphorus is present in the casting in excess of about 0.05 per cent, it may be detected by immersing a piece of the casting for ten seconds in a solution of ferric chloride (25 grams ferric chloride and 25cc hydrochloric acid in 100cc of water) then rinsing in running water. Phosphorus is indicated by a darkening of the casting; the color is almost black when the phosphorus concentration approaches 0.25 per cent.

Quantitative determination of phosphorus is most readily accomplished by the photometric method described in standard texts.

Refining—Since phosphorus is used as a deoxidizer, it follows that the chief method of removing excess phosphorus is by oxidation. Blowing with air, Glassenberg et al[18] were able to reduce phosphorus in ounce metal from 0.12 per cent to 0.07 per cent. Using oxygen they were able to reduce the same initial concentration to 0.01 per cent.

Hanson and Pell-Walpole[19] claim efficient phosphorus removal with a flux containing 33 per cent each of copper oxide, sand and borax.

The reaction of phosphorus with oxygen forms phosphorus pentoxide. It is common to slag this oxide with lime, forming a phosphate slag which is easily separated.[35]

Most of the co-operating firms listed the same refining procedures for phosphorus as for iron. Notable exceptions were firms reporting the sole use of borax, charcoal, or niter.

MANGANESE

Effect—As an impurity in copper-base alloys, manganese is considered harmless up to 0.2 per cent. Above that concentration it tends to have similar effects as aluminum, although not nearly so pronounced.

Detection—Manganese, as an impurity, cannot be visually detected in the molten bath. In the castings, rapid identification can be made by dissolving about 1 gram of the sample in concentrated nitric acid, then adding a gram of lead peroxide or sodium bismuthate. If manganese is present, a deep purple permanganate color will develop. Several standard methods are available for the quantitative determination of manganese.

Refining—Manganese may be readily removed by oxidation.[18, 19] As in the case of iron, the removal is facilitated by the use of a siliceous flux which causes the manganese silicate to slag off.

The great majority of reporting firms remove manganese by the same refining procedures they use for iron.

SILICON

Effect—Silicon is added as an alloying element to form silicon bronzes which have great corrosion resistance, strength and toughness.

As an impurity silicon is only slightly less critical than aluminum. Similar to aluminum, it forms solid oxide films which cause the same phenomena of unsoundness and lead sweating as do the aluminum oxide films. In leaded bronzes, silicon forms lead silicate compounds which seriously impair fluidity. The limit on silicon is 0.005 per cent when determined on a 10-gram sample.

Detection—In the molten bath and on castings silicon may be detected by the same silvery sheen as produced by aluminum. In fact, if the nature of the original charge is unknown, it is almost impossible to determine in this manner whether the contaminant is aluminum or silicon.

Chemically, silicon may be detected and determined by a simple but long precipitation method or by a faster but more complex photometric method, both of which may be found in standard texts.

Refining—The literature reports the removal of silicon by air or oxygen;[18] by manganese dioxide or a mixture of cuprous oxide and salt;[19] by reaction with lime[17] and by the use of fluoride bearing fluxes.[22]

The majority of reporting firms use the same method for the removal of iron and silicon or aluminum and silicon. One notable exception adds iron, then blows with air. Several firms report the sole use of soda ash with air.

SULPHUR

Effect—Sulphur is never added as an alloying element. The maximum allowable concentration of this element varies from 0.05 to 0.08 per cent in the different specifications. This element, which is usually absorbed during melting by reaction with sulphur-bearing liquid or solid fuels, forms little particles of copper sulphide which reduce the fluidity of the metal. At "high" casting temperatures (temperature unspecified in Ref. 19) a reaction may occur between the copper sulphide and any tin oxide present. This reaction will evolve sulphur dioxide gas, which will cause porosity.

Detection—Sulphur is difficult to detect or determine quantitatively. The most common methods are the combustion method and that which requires digestion into ammoniacal cadmium chloride. Unfortunately, sulphur does not lend itself to spectrographic analysis.

Refining—According to the literature, oxidation is a common method for removing sulphur.[23, 34, 44] Lithium has also been recommended.[28, 29, 46] Lepp[26] recommends the use of barium sulphate for desulphurization.

The field survey revealed that the use of magnesium in concentrations from 0.5 to 1 per cent is considered very efficient for removing sulphur.

The use of soda ash is next in popularity, with one firm specifying that the sodium carbonate be introduced below the surface of the metal.

Another firm reports efficient sulphur removal by the use of green poles along with soda ash. This firm states definitely that air is not used to mix the flux with the metal.

Other firms report the sole use of niter, borax or powdered glass.

TIN

Effect—Tin is not normally considered an impurity. One exception would be the high-tensile manganese bronzes where the upper limit is usually 0.2 per cent. In these bronzes it is felt that the tin lowers the strength and ductility, although it does have a beneficial deoxidizing effect.

In tin-bearing bronzes care must be exercised to prevent oxidation of the metal since the tin oxide forms solid particles which tend to make the metal sluggish. Tin oxide is soluble in fluxes such as silicates and borates and this fact leads to loss of tin.

Detection—When brass is dissolved in nitric acid and the solution boiled for a few minutes, tin, if present, will form a white, cloudy precipitate. This white solid may be filtered off and weighed for the routine determination of tin. Experienced sorters are able to estimate the tin content of a brass or bronze by observing a fresh fracture.

Refining—Although there is a loss of tin when oxidation is being performed for the removal of impurities in high-tin bronzes, oxidation is not an efficient method of removing tin when it is present as an impurity in low concentrations.

Besides the mention of scorification of tin in metals other than copper and copper-base alloys, the author was not able to locate any literature describing the removal of tin.

The field survey revealed that tin content is controlled by dilution only; no refining procedures were reported.

Two firms did report the use of green poles to reduce the tin oxide when the metal had become sluggish due to excessive formation of tin oxide.

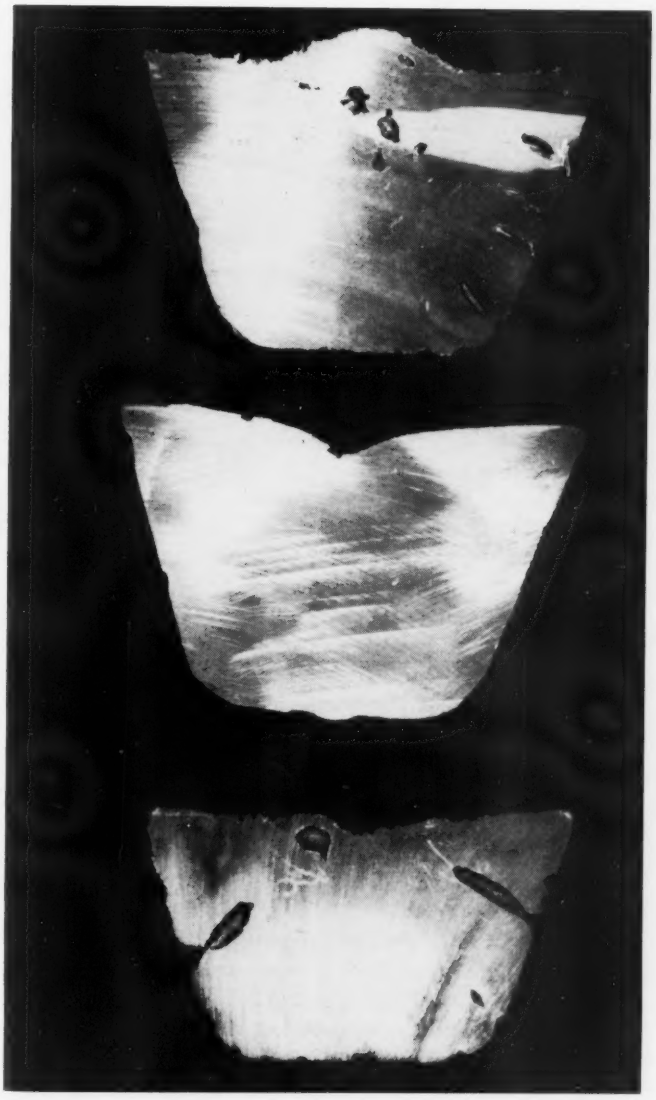

Fig. 3—Gassed and ungassed metal. Top, ingot contained excessive reducing gases; center, ingot without gas; bottom, highly oxidized ingot

ZINC

Effect—Zinc, of course, is an alloying element in most common brasses and bronzes. In high-phosphor bronzes, lead bronzes, and tin bronzes used for bearings and gears, zinc has a tendency to reduce wear resistance, and in these alloys it is uually held below 0.75 per cent.

Detection—The white fumes encountered in melting zinc-bearing alloys are familiar to all foundrymen, some of whom have suffered the "zinc shakes" from having inhaled or ingested excessive zinc oxide fumes. When heated, the zinc oxide is yellow; it turns white upon cooling.

The most positive identification of zinc is by the polarographic detection of its wave in either acid or ammoniacal medium. Alternately, there are several more time-consuming chemical tests to be found in the standard texts.

Refining—Considerable zinc is lost during the removal of almost all the impurities, especially when air is being blown through the melt. True to form, however, the removal of zinc becomes progressively more difficult as its concentration is lowered, and when attempting to remove zinc from high-tin and high-lead bronzes, tin and lead are lost.

In spite of this loss of alloying elements, oxidation is the accepted method of removing zinc. Most firms reported the use of air alone, while others used flux mixtures similar to those used for other impurities. One firm uses a mixture of 70 per cent powdered glass and 30 per cent iron borings as a flux during the oxidation.

GASES

Effect—Gases as a source of difficulty in foundry work have been given the most extensive literature treatment of all the impurities in copper-base alloys, and the references listed in this section are intended to be representative rather than comprehensive. General studies of gases in metals may be found in the work by Eastwood[10, 11, 12] and in the work published by the American Society for Metals.[42] There are numerous individual papers such as those by Dietl[8] and Smith.[41]

Both oxidizing and reducing gases are encountered in copper-base alloys. Oxygen and air, of course, make up the former type, while the latter type includes hydrogen, carbon monoxide and sulphur dioxide. Of the two types, reducing gases are generally considered the more detrimental. For this reason, melting procedures for copper-base alloys, with the exception of high-zinc alloys, usually call for the maintenance of a slightly oxidizing atmosphere or melting under an oxidizing flux.

Theoretically, it would be ideal to have no gas in the metal. In practice, many foundrymen feel that a "small" amount of gas is beneficial to pressure tightness, and of course it is almost impos-

sible to prevent the pickup of at least a minute amount of gas.

Some of the gases, such as oxygen, can form compounds with the metals in copper-base alloys. Gases may also be present merely mechanically. Other gases, such as hydrogen, may actually form a solution with the metal. The solubility of hydrogen increases with temperature. Upon solidification of the metal, therefore, the metal tends to liberate the dissolved gas—trapping some of it and causing porosity or leakers, or other faults.

In addition to porosity, oxidizing gases will convert the metals to oxides, leading to sluggishness and loss of metals as described in the section on tin.

Fig 3 illustrates the appearance of gassed and ungassed metal. The center ingot contains no gas. The lower ingot is highly oxidized, and the upper ingot contains excessive reducing gases. Notice that although both gassed ingots show porosity, the upper ingot has a bulge formed by the liberation of the reducing gases as the metal cooled.

Detection—Experienced metal men can determine by the appearance of the melt whether the metal is highly oxidized or reduced, but there is no visual way of estimating the amount of contamination. In a furnace, if the metal is under a reducing atmosphere, its surface is shiny and glassy in appearance. If the atmosphere is oxidizing, the surface of the melt will be rough and dull looking.

Examination of the inside surface of cavities such as those in Fig. 2 will reveal if the gas was reducing or oxidizing. If the former, the cavities will be bright and scale free; if oxidizing gases were present, an oxide film will have formed over the surface of the cavities.

Chemically the gases are not easy to detect or determine, and most analyses of this type are sent by the foundries to commercial testing laboratories with the necessary equipment.

Refining—It is obvious that some of the refining methods suggested for the other impurities will serve to add oxygen to the melt. The air, an oxidizing flux, or even the slag itself can add oxygen to the metal. In these cases excess oxygen and oxides must be subsequently removed.

In zinc-bearing alloys, when the zinc loss due to refining is replaced, deoxidation is also accomplished.

The removal of gases from copper-base alloys may be accomplished by flushing with an inert gas such as nitrogen.[24, 25, 27] These inert gases are themselves insoluble in copper-base alloys and they carry the gaseous impurities out of the melt mechanically.

Gases may be removed by presolidification or soaking at specified temperatures[2, 24]; by vacuum degassing[3]; by the use of lithium[28, 29, 46]; and by the use of fluxes.[19, 24, 27, 33]

The survey showed that most firms believe prevention is the best cure for gas troubles. The control of furnace atmosphere and the use of covering fluxes are the most common procedures reported.

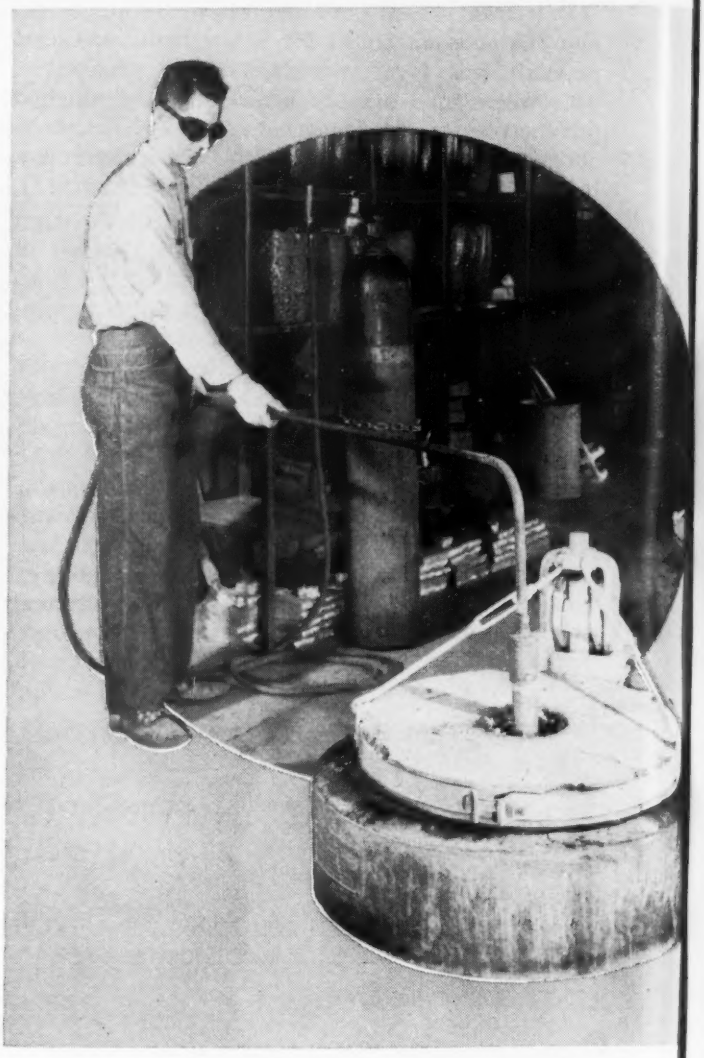

Fig. 4—Illustration shows a method of flushing gassy metal. A new technique is vacuum degassing, described in FOUNDRY, Dec., 1954, p. 78

Once gases have been absorbed, flushing is the most commonly used method of removing them.

Oxides and oxygen, of course, are removed by the use of deoxidizers such as phosphorus, zinc or aluminum (in the case of yellow brasses). It should be mentioned here that deoxidation by phosphorus forms a phosphate slag which does not deoxidize tin oxide. If the melt is deoxidized with carbon or carbon monoxide or sodium, the tin oxide is reduced and the tin returns to the melt. As mentioned previously, poling has the effect of supplying carbon and carbon monoxide to effect this reduction of tin oxide, and the use of poles for this purpose was reported.

Poling is almost always followed by air blowing for the double reason that a small amount of oxidizing gases is considered less harmful than a small amount of reducing gases, and it is easier to control the amount of air used than to determine the quantity of reducing gases absorbed from poles.

Neither lithium nor vacuum degassing were reported as methods used in practice.

Conclusion—There is a lack of literature on the refining of copper-base alloys, and there is a great need for more papers on the subject.

Many of the reports already in the literature are vague in detail and sometimes contradictory. This would suggest the advisability of reporting pertinent control data along with results in future papers. Thus, instead of merely reporting that X was used successfully to remove A, it would be of much greater value if we were told that 1 per cent of X at 2300° F in a fireclay-lined crucible containing 85-5-5-5 accomplished the removal of 0.4 per cent of A. The report by Glassenberg et al[18] might be used as an example of a good report in this respect.

Refining practices used in industry vary widely and few authoritative data are available on the effectiveness of the various procedures. At least part of the reason for this lack of information has been an apparent reluctance of foundrymen and ingot makers to share information.

The favorable reaction and co-operation rendered the questionnaire used in the preparation of this article indicate a willingness to submit information to a central source designed to render a non-partisan information service.

It is hoped that this paper will encourage others in the brass and bronze melting field to provide information along similar lines.

Acknowledgment—The author wishes to thank the Stotter Metal Co., Cleveland, for supplying the ingots used in the photographs. I also with to thank my wife who assisted in the study and tabulation of the data submitted on the questionnaires.

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LIST OF CO-OPERATING FIRMS

(In addition to the listed firms, 49 other companies returned the questionnaires, but chose not to be listed.)

Advance Aluminum & Brass Co., Los Angeles; Albany Bronze Foundry, Boston; Allis-Chalmers Mfg. Co., Norwood, O.; Ampco Metal Inc., Milwaukee; Barnes Mfg. Co., Mansfield, O.; Baxter Foundry & Machine Works, Boise, Idaho; Beckett Bronze Co., Muncie, Ind.; Brothers Foundry, Anniston, Ala.; Buckeye Brass & Mfg. Co., Cleveland; California Smelting & Refining Co., Los Angeles; C. I. Capps Co. Inc., Jacksonville, Fla.; Coldwater Brass Co., Coldwater, Mich.; Consumers Metal Corp., Detroit; Dorchester Brass & Aluminum Foundry, Hyde Park, Mass.; William Duncan Co., East Boston; Elesco Smelting Corp., Chicago; Food Machinery & Chemical Corp., Vernon, Calif.; Sonken Galamba Corp., Kansas City, Kans.; Henning Bros. & Smith Inc., Brooklyn; M. Holtzman Metal Co., St. Louis; The Imperial Brass Mfg. Co., Chicago; Knapp Foundry Inc., Guilford, Conn.; H. Kramer & Co., Chicago; Empire Brass & Aluminum Foundry, Milwaukee.

R. Lavin & Sons, Chicago; Liberman & Gittlen Metal Co., Grand Rapids, Mich.; Lincoln Brass Works Inc., Detroit; Lumen Bearing Co., Buffalo; Manufacturers Brass Foundry Inc., Chicago; National Brass Works Inc., Los Angeles; Natural Bronze & Aluminum Castings Co., Detroit; Northwest Brass & Aluminum Foundry, St. Paul; Norwood Foundry Co. Ltd., Edmonton; Pacific Brass Foundry, San Francisco; Ohio Brass Co., Mansfield, O.; Randall Graphite Bearings Inc., Lima, O.; River Smelting & Refining Co., Cleveland; I. Schumann & Co., Cleveland; Scovill Mfg. Co., Waterville, Conn.; E. G. Soeth Brass Foundry, Oakland, Calif.; Standard Casting Corp., Chicago; Sterling Brass Foundry, Elkhart, Ind.; Stotter Metal Co., Cleveland; Superior Brass & Aluminum Casting Co., Lansing, Mich.; Superior Brass Works, Detroit; Welsbach Corp., Philadelphia; Western Brass Works, Los Angeles.

View of miscellaneous shell cores made at Production Pattern & Foundry Co.

SHELL CORES . . .

Their Production and Application

MOST of the new foundry techniques developed in recent years have attracted considerable attention upon their announcement. In some cases there have been strong claims regarding the probable revolutionary effect of these processes on the foundry industry. It is our belief that the use of shell cores will have a greater influence on coremaking practice than any of the other new developments will have on foundry operations in general.

Production of shell cores has been a natural outgrowth of the shell molding process which, incidentally, is taking over a steadily increasing percentage of casting production. Most foundries tried to make shell cores shortly after starting shell molding. The cores we made varied from mediocre to good, but the pain and strain we had making them made these early shell cores a production liability.

When we speak of shell cores, we are talking of a core made usually of silica sand and bonded with phenolic resin. This core may or may not be hollow, depending on the core cross section. Normally, most of us think of shell cores as being hollow and consisting of a core section of about $\frac{1}{8}$ to $\frac{3}{8}$-in. thickness lining the corebox cavity.

As is well known, phenolic-resin-bonded sand cures quickly, but it is necessary to maintain a pattern or corebox temperature of between 400 and 600° F to accomplish this curing. In the case of shell molding, it has been a relatively simple problem to mechanize the handling of the hot pattern plates through the investing, curing and ejection operations. Shell molds are being made on automatic machines at a high rate of production without the operator ever touching the hot pattern.

In this early work with shell cores, and still in many shell core operations today, the hot coreboxes are handled by operators wearing heavy gloves. We have heard the comment that making shell cores in this fashion is like tying your tie while wearing boxing gloves. Of course, this is not so bad with the simple types of cores. Sand-resin mix can be poured into a dump type corebox,

Left—Shell mold castings were made in aluminum and copper-base alloys, gray iron, pearlitic malleable, stainless and low-carbon steels and magnesium. Shell cores are used where required

Below—Shell technique works well in production of pattern castings. Left to right: 1. Wood master patterns. 2. Aluminum master patterns. 3. Two as-cast iron shell patterns. 4. Same two parts with machining completed. Hand finishing will complete these parts before mounting. Shell core-boxes for casting are at the extreme right and in back of pattern castings

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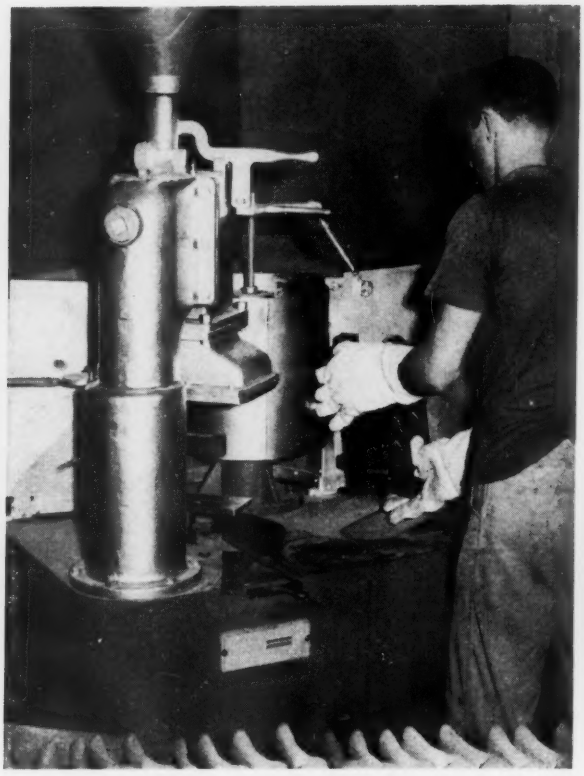
for example; the box is emptied in a few seconds, leaving a thin shell. The box then can be set in a small oven for a short time while the same operation is being done on another box. The first box then is removed from the oven and jarred on a table to hit the bottom of the ejector pins; this frees the shell core from the box and the operation is repeated.

In our own foundry operation, we were forced to find a better way to make shell cores. It required over three years of development work before we had equipment which would make shell cores easily and of best quality. We discovered along the way that many of our green sand molding difficulties were overcome by setting accurate shell cores in our molds. Crushes and shifts caused by core sagging and distortion were eliminated. The amount of machining subsequently required of the castings was reduced and in some cases eliminated entirely.

In castings where liquids, air or gases flow through the cored passages, the efficiency of the unit in which the casting is used has been greatly increased by the switch to shell cores. Venting problems have been minimized because hollow shell cores eliminate any chance for core gases to cause blows if vented at the open end of a coreprint. In addition, shell cores break down during the casting cooling so that they pour out of the casting at shakeout. Incidentally, after screening, this core sand may be reused for shell molds, shell cores or added to green sand, since all of the bond has been burned out of the free flowing portion which has been inside the casting.

We were forced into shell cores because we could not make our conventional cores sufficiently accurate to fit well in a shell mold. We had to make them fast enough to keep up with automatic shell molding machines. Permanent mold castings which require sand cores also have benefited through the use of shell cores. Here also, the need for accuracy is vital because the metal mold has no flexibility. Shell cores permit production of permanent mold castings with the cored passages as smooth or smoother than the outside

How Shell Cores Are Blown and Cured



Views show sequence of coreblowing operation. While one three-impression cast iron corebox is in oven, at rear of machine, the operator blows resin-coated sand in the other. In the second view, the corebox is rotated 180 degrees around the supporting arbor as soon as it has been blown. Next, the operator holds a plate against the back of the corebox for a

molded surface, which, of course, is very good.

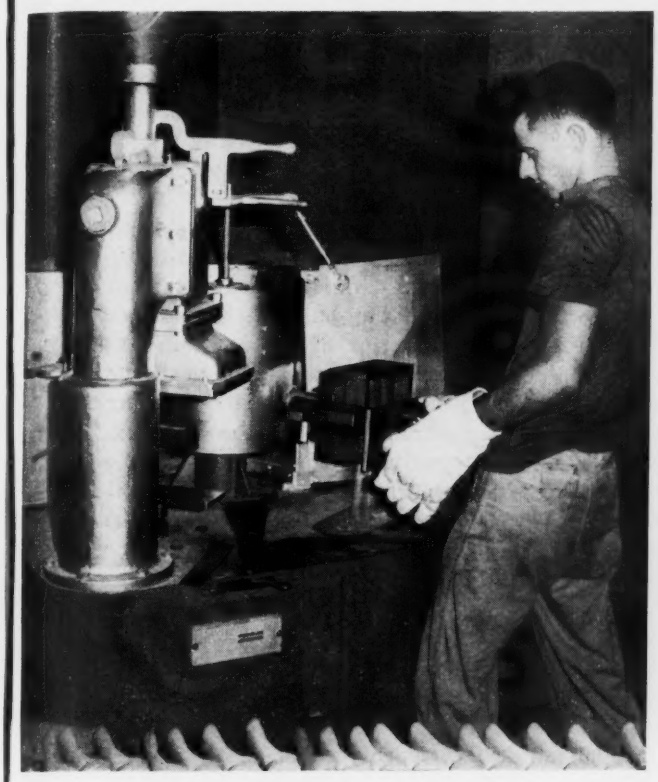
Beyond all of the advantages described above, shell cores are economical to make. Thus it is our strong feeling that shell cores will make a much heavier penetration of the foundry industry as a whole than any of the other new developments to date.

Requirements of the Process—The average foundryman asks what is required for him to use shell cores. Here, as was the case with shell molding, there has been a mistaken conception that only the high-production jobs are adapted. We operate a jobbing foundry and have always been faced with short runs involving many pattern and corebox changes during the course of a shift. Our shell molding and shell core equipment has been designed with primary consideration being given to quick changeover.

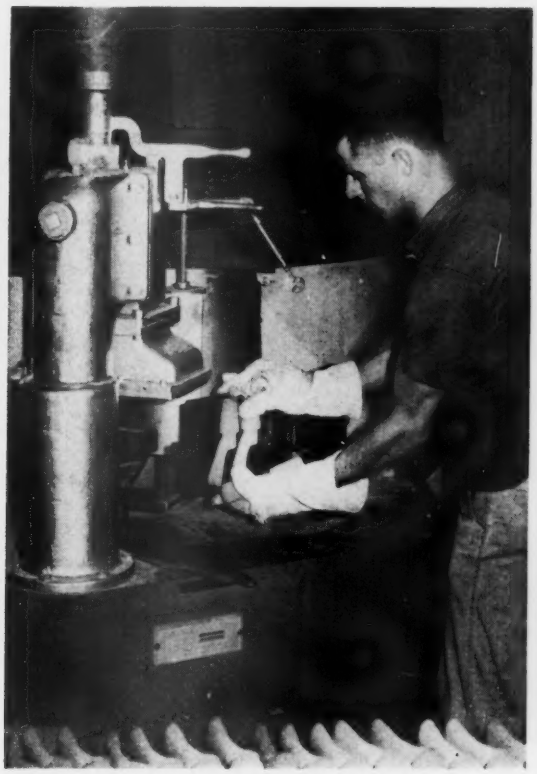
Metal coreboxes are required for shell coremaking. These should be made of a material which will stand up without warpage and undue wear for the production required over a reasonable length of time. Plain gray iron or various alloys of long-wearing, heat-resisting, fine-grained iron will be the most widely used shell corebox material. In some cases we prefer steel coreboxes in our foundry, as will be discussed later. Copper-base alloy coreboxes work very well in shell coremaking because of their high thermal efficiency and relative resistance to sand abrasion. In many cases aluminum boxes will work quite well for simpler types of cores. However, in addition to the mediocre wearing properties of aluminum, this material tends to warp and distort at the necessary elevated temperatures. It is necessary to keep a good tight joint or face on coreboxes when blowing shell cores.

Blowing Is Preferred—We have found that blowing produces the most accurate, dense and smooth core surface. This, of course, is reflected in improved casting surfaces. Our experience has proved that much more intricate shell cores can be blown if the resin-coated sand enters the top of the corebox. There is less tendency for air blow-by when this method is used. It is a simple matter to rotate the corebox 180 degrees when it is supported by the shell core machine. After rotation the excess material from the center of the core can easily be vibrated out of the corebox. This material is returned to the shell core machine for reuse.

It is obvious that shell core production can be greatly improved, if not doubled, if the operator is working two coreboxes alternately on the shell core machine. With this technique, there is no lost time waiting for a shell core to cure. The



few seconds. This plate is mounted on a pivoting arm attached to core machine. Touching the box causes a vibrator to assist removal of excess material from center of the cores.



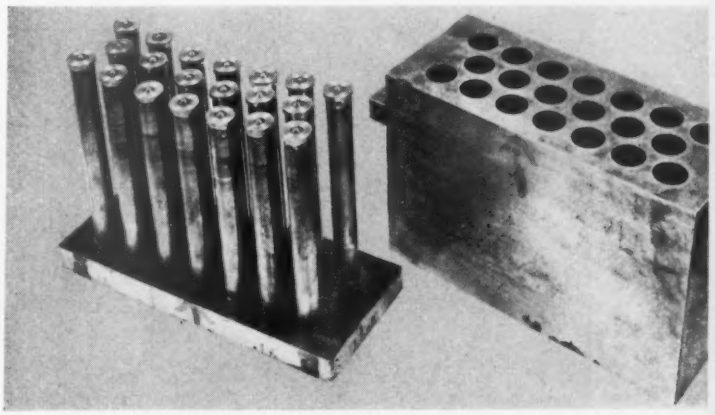
Last, the boxes have been rotated around the center trunnion, and the cured cores are removed from corebox which was in curing oven. In this operation, hinged coreboxes are used

two coreboxes are mounted 180 degrees apart about a center trunnion. While one corebox is being emptied of its cured shell core or cores, the new core is blown and the excess sand dumped, the other box is in the oven curing its cores. This operation is repeated continuously, care being taken by the operator to see that the face of the corebox is blown or brushed free of loose sand particles.

With simple type cores ejected from solid steel coreboxes, we have run for extended periods of time completing a box cycle every 20 seconds. In one case, with a 39-impression corebox, the operator makes 117 cores per minute. These cores are not handled until they are set into the mold. As they are ejected from the corebox on the shell core machine, they fall into a chute which carries them into a core storage container. We prefer steel as a corebox material for various types of cores which can be ejected or pushed through a solid corebox. The core cavities are machined from a solid block of steel. It is amazing to check the accuracies of shell cores ejected in this manner. There are no traces of seams or parting lines on the cores, and round cores are accurate within 0.001-in. around the diameter. Small pin cores are made solid because it is impractical to attempt to hollow out the center.

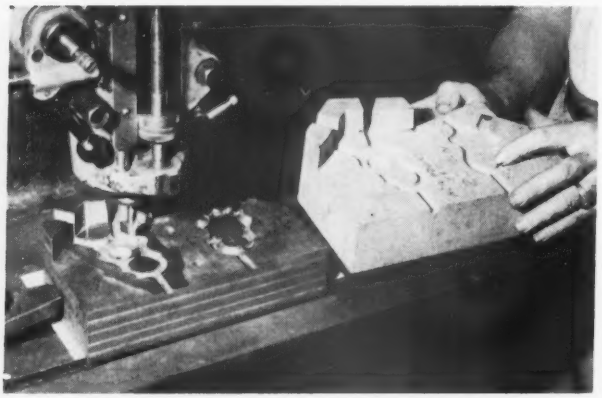
Some shapes of cores permit the use of hinged coreboxes. We secure the back half of the coreboxes to our shell core machine, and the front half swings open. This permits easy removal of the cores and ready inspection or cleaning of the corebox cavity. In this case also, the operator at no time is required to lift or carry the hot corebox during the coremaking operation.

Making Intricate Shapes—The more intricate



Solid steel corebox produces 20 cores 1⅛ in. in diam by 7¾ in. long to very close tolerances. Core ejection plate pushes cores from box

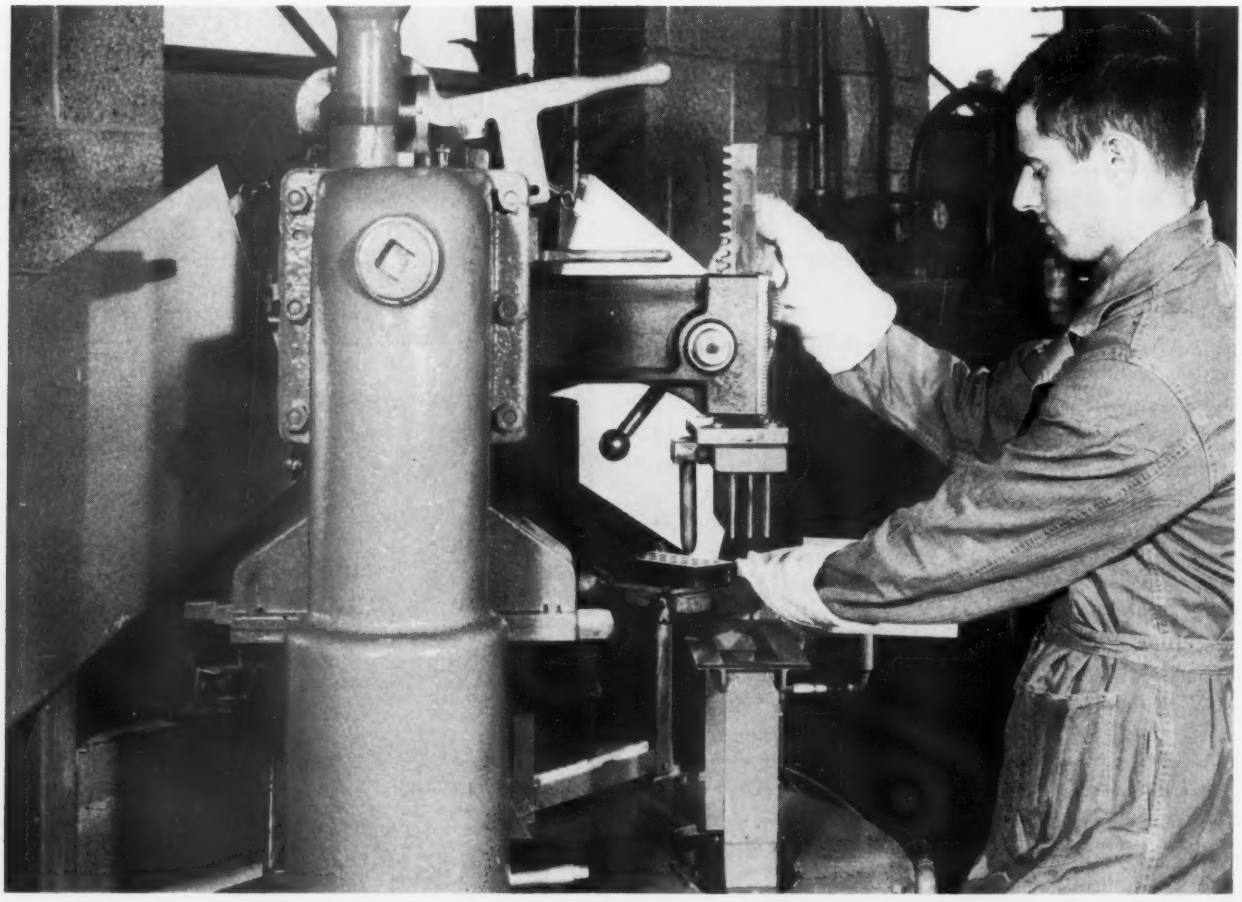
shapes of cores cannot be made in either push-out or hinged coreboxes. The greatest advantages can be realized in many cases in the changeover of these trickier cores to shell. The casting user is not interested in paying for core driers, core plates, vents and rods. We have developed a corebox opening fixture that is used on our shell core machine. With this fixture, the most fragile, straight-sided shell cores can be made. As the corebox is indexed to the ejection position, the opening fixture engages the outer half of the corebox and also the ejector pin plate in the back of the inner half corebox. The first ¼-in. of straight draw moves the outer half of the box and the ejector plate on the inner half. This forces the core evenly out of the back half of the corebox as it stays in the front half.



Above—Shell coreboxes of intricate shapes can be machined from alloy iron to close tolerances

As the forward movement continues, the back ejector plate is released through cams and the core is completely drawn from the back half of the corebox. Then the front half of the corebox is tipped toward the operator by the opening fixture at a 45-degree angle. The last portion of the travel moves the ejector plate forward, releasing the core from the front half of the corebox, through equalizing ejector pins connected to the ejector plate. The operator then lifts out the ejected core and closes the corebox to repeat the cycle. With the corebox open in the 45-degree position, it may be readily cleaned, inspected or sprayed.

As is the case with any manufacturing operation, the best results are obtained with good equipment and tooling. The best shell core equipment would be of little value to us without coreboxes made of the proper material, smoothly polished and properly engineered. Similarly, a properly engineered shell corebox can double your production as well as produce better cores when mounted on a good shell coremaking machine.



Operator moves corebox from oven to core ejection station in right foreground. Corebox just blown enters oven at lower left. One stroke of handle in operator's right hand will eject 39 cores out of solid steel corebox into storage container. He produces 39 cores in 20 seconds

Hot Strength of Clay-Bonded Sands

High-temperature properties of clay-bonded sands and influence of various additives were measured by the author. Special equipment increased sand temperature as rapidly as a mold surface is heated when molten metal is poured

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BEFORE we can understand the reasons for casting defects caused by mold surface failure, we must devise tests to show how sand on a mold face behaves while the mold is filled.

Sand is a poor conductor of heat, and considerable time is required to obtain a uniform temperature when a cold test-piece is placed in a hot furnace. On the other hand, sand on a mold face is heated very rapidly while a mold is being filled. Changes may be completed in a slowly heated test-piece which are not completed in a mold surface because of the short interval between the start of pouring and complete filling of the mold.

Importance of the time factor is clear when the sand contains organic materials, such as seacoal or wood flour, which decompose when heated. Although decomposition may be completed in a slowly heated test-piece, it may not have proceeded very far in the time required to pour a casting. It is less widely recognized that clay also decomposes slowly—much more slowly than most of the organic materials added to molding sands. In consequence, results of tests made on slowly heated test-pieces have no validity when applied to sand on a mold face.

The first essential in testing sands at high temperature therefore is to find a means of obtaining a test-piece which has been raised to testing temperature as fast as a mold surface is heated during pouring. One method is to reduce the size of the test-piece until it can reach a uniform temperature in the same time required to fill a mold with molten metal. The conductivity of silica is so low, however, that a very small test-piece would be required, and very small test-pieces are not satisfactory for tests of a granular material such as foundry sand, which is frequently heterogeneous in composition and always heterogeneous in packing.

The introduction of capacity heating—a method in which a nonconductor to be heated is placed between the plates of a condenser connected with an alternating current of high frequency—appeared to offer a means of obtaining the required rate of heating. It is particularly suitable for heating granular materials of poor heat-conductivity since each grain is heated individually. The electrical characteristics of silica are such, however, that rapid heating is difficult, and since at the same time the rate of heating required is much faster than that needed in any commercial application, it is necessary to build apparatus of an entirely new design.

This report describes the results of strength tests made on foundry sands heated in such apparatus and compares them with the results obtained on similar sands heated in a conventional heater. Considerable doubt exists as to whether hot strength has any bearing on the behavior of a mold face during pouring, provided it is not too low to resist whatever stresses may be imposed upon it. Where it is reported, the hot strength should, however, be that of the mold face, not one which cannot be reached when a casting is poured.

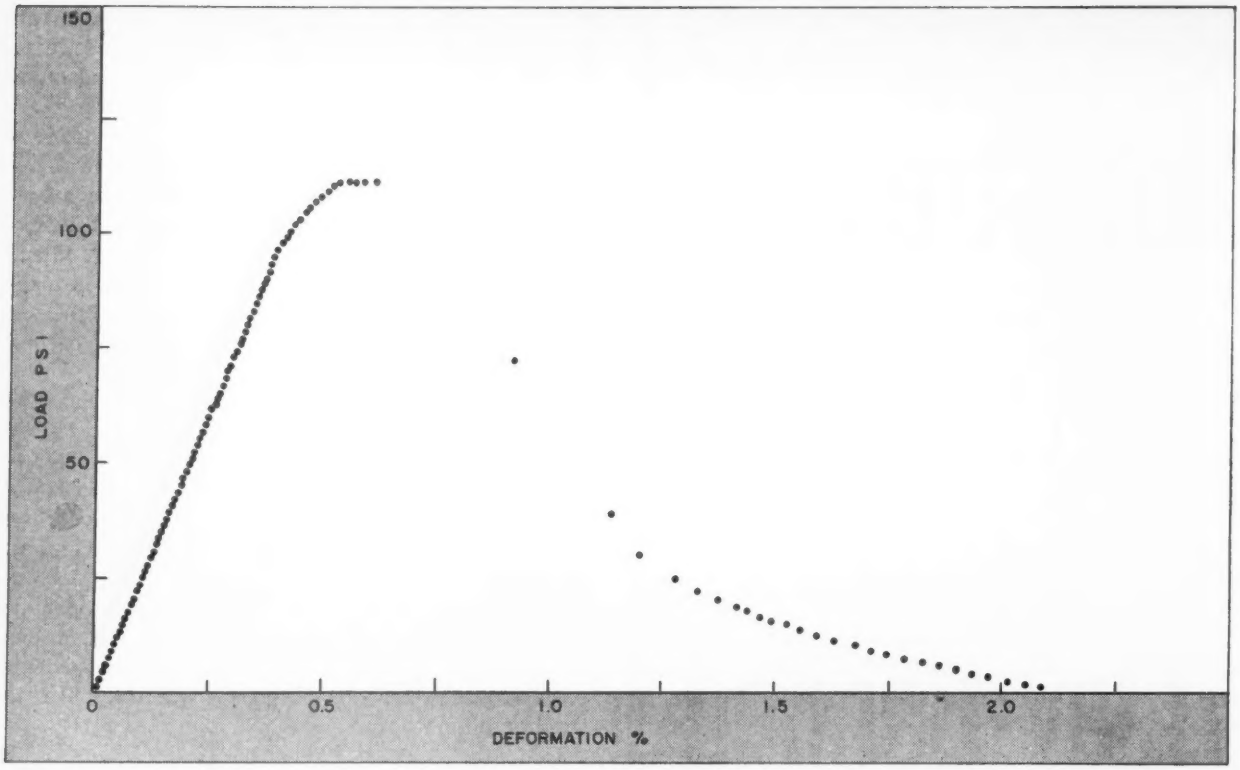


Fig. 1—Chart shows stress-strain curve for uniform-grained silica sand. Bonded with 5 per cent bentonite, it was tested dry at room temperature

Construction of Heater—The heater operates with a frequency of 100 megacycles, and the condenser plates are curved to enclose the test-piece as completely as possible. This arrangement gives very uniform heating, but some heat is lost by radiation. Although this loss is kept to a minimum by shields, it persists to some extent. In view, however, of the low heat conductivity of silica and the short time between start of heating and completion of a test, the cooler zone is very shallow.

The upper and lower ends of the test specimen are in contact with plates backed by the main insulators. To obtain uniform heating of the specimen, the field must extend well beyond it, into the insulator plates, which also become heated. For temperatures up to 500-600°C, glass plates are used. With glass having a suitable loss factor, the plates can be made to warm up at the same rate as the sand test-piece, and the ends of the test-piece are at the same temperature as the interior. In the higher temperature range, fused quartz plates have to be used. These tend to warm up more slowly than the sand itself. There is therefore again a slight fall in temperature at the extreme ends.

The depth of the cooler zones is, however, very small and to minimize their effect on test results, the standard AFS test specimen is used in preference to the 1-in.-diam specimen frequently used in high-temperature testing.

The test-piece is heated in position in the testing machine. The face plates of the insulators act as holders for the specimen, and the load is transmitted by the insulators themselves. When the required temperature has been reached, the current is switched off, and the test is carried out and is completed in a few seconds. Detailed descriptions of the heater have been published previously.[1, 2]

Measurement of Temperature—To determine the temperature of the test-piece, a hole $\frac{1}{8}$-in. in diam is drilled to a depth of 1 in. along the neutral axis. The drilled end is at the lower end when a test is made. A corresponding hole is made in the lower insulator plate, and before a test is made a thermocouple is pushed into the test-piece from below.

With the rapid rate of heating attained—nearly 500°C per minute—a very light thermocouple is required to keep the lag to a minimum. The extent of any lag can be observed readily when the equipment is rigged for carrying out expansion tests on quartz since the change in expansion at the α-β inversion will appear at a temperature which is less than 573°C by the extent of the lag. In the tests reported, the thermocouple did not lag behind the specimen by more than 5°C.

The thermocouple does not heat up independently of the sand. When sands containing organic matter are tested, however, a layer of carbonaceous matter builds up on the surface of the thermocouple. Since this layer usually has a higher loss factor than the sand, it heats up more quickly, and the temperature recorded is not a true one. If the couple is cleaned after each test, the temperature recorded is that of the test-piece. The hole drilled along the neutral axis has no important effect on the strength recorded.

Rate of Heating—The rate of heating depends on the potential difference across the plates, the frequency of the current and the loss factor of the material being heated. The first two factors are constant during a test, but the loss factor of silica increases with temperature, and the rate of heating tends to rise as temperature becomes higher. The rate of heating is 5°C per second up to 100°C and 10°C per second between 900°C and 1000°C, with an over-all average up to 1000°C of 7.5°C per second. It is possible to maintain a constant rate of heating, but only by reducing the rate at the higher temperature to 5°C per second. If any criticism of the rate of heating is made, it is likely to be that it is lower than that of the sand on a mold face during pouring.

Testing Equipment and Method of Testing—The test-piece is tested in compression, the load being applied by a constant speed motor via a calibrated bar of spring steel supported on two knife-edges. By this arrangement there is an automatic relaxation of stress as the test-piece deforms.

With an arrangement of mirrors, a complete stress/strain curve for the test-piece is drawn automatically on a photographic plate. When a lamp which flashes five times per second is used as a light source, the stress/strain curve is in the form of a series of dots made at intervals of one-fifth of a second, and the rate of strain and of increase in load can be observed.

The stress/strain curve for a uniform-grained silica sand bonded with 5 per cent bentonite and tested dry at room temperature is shown in Fig. 1.

For this sand the maximum stress is 110 psi, deformation at maximum stress is 0.6 per cent, and the test-piece shatters immediately after the maximum stress has been reached. With a series of such curves at various temperatures in the range from room temperature to 1000°C, the maximum stress or "hot strength" over that range can be obtained. The test rig has previously been described in detail.[1, 2, 3, 4, 5]

Sand Tested—The majority of tests made so far have been on a fairly pure (99 per cent + SiO_2) silica sand bonded with western bentonite. One series of tests on a natural sand containing kaolinitic clay and some iron oxide is also included. Room temperature properties of the two sands are as shown in Table I.

TABLE I—Room Temperature Properties of Sands

	Synthetic Sand	Natural Sand
Moisture, per cent	2.6	4.5
Permeability, No.	143	30
Green compression, psi	6.8	8.8
Dry compression, psi	110	100
+ 44 mesh, per cent	2.6	
+ 60 mesh, per cent	26.1	3.6
+100 mesh, per cent	62.3	31.0
+150 mesh, per cent	7.8	36.9
+200 mesh, per cent	0.5	10.4
−200 mesh, per cent	0.3	6.7
Clay, per cent	0.4	11.4
	+5% bentonite	

Hot Strength—Maximum stress or hot strength of these sands in the range from room temperature to 1000°C was obtained from a series of curves similar to that shown in Fig. 1. Results are plotted in Figs. 2 and 3.

As temperature rises strength of the synthetic sand increases slightly, reaching the maximum of 125 psi at about 1000°C. This rise is followed by a rapid fall. A similar slight increase occurs in the strength of the natural sand, but strength is maintained beyond 1000°C. This kind of strength/temperature curve has been obtained with all the sands tested, both natural and synthetic.

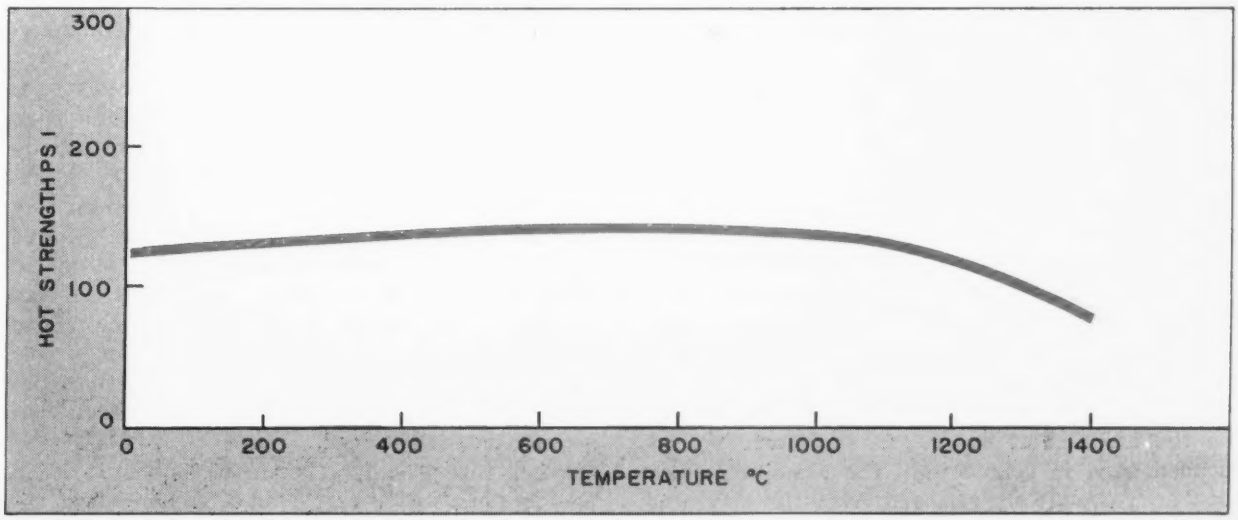
Although all the strength/temperature curves obtained were of the same kind, they differ in two ways:

1. The actual strength, which depends mainly on the amount and kind of clay and the moisture content before drying and to a smaller extent on the grading of the sand.

2. The temperature at which hot strength begins to fall, which depends on the initial fusion point, or softening point, of the clay.

From these results it follows that *the hot strength of a clay-bonded sand at all temperatures up to that at which the clay begins to soften is approximately the same as the dry strength at room temperature, provided that the rate of heating in*

Fig. 2—Maximum stress or hot strength, synthetic sand, in range from room temperature to 1000°C



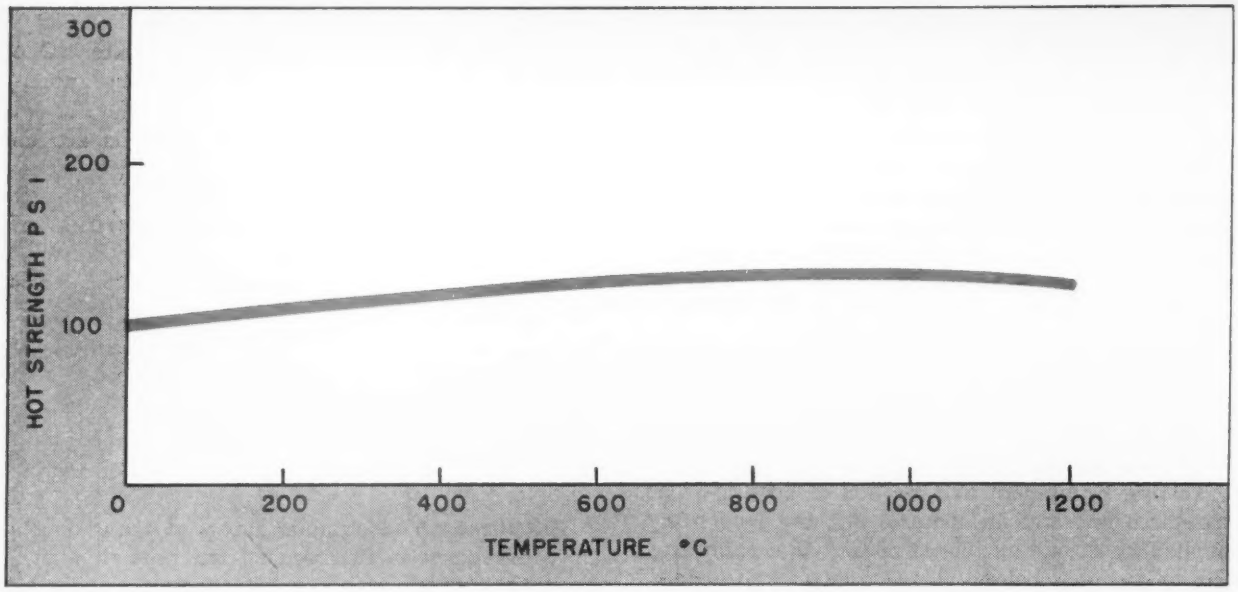


Fig. 3—Maximum stress or hot strength, natural sand, in range from room temperature to 1000°C

the range room temperature to 1000°C is not less than 400°C per minute.

Sand Heated in a Conventional Furnace—When a cold, dry test-piece is placed in a hot furnace at a steady temperature, a considerable time elapses before a uniform temperature is reached throughout the test-piece. This time depends on the dimensions of the test-piece, on the operating temperature and on the kind of sand used. For example, with a standard AFS test-piece made from the synthetic sand described above, the time required for the temperature at the center to be raised to within 10°C of the surface temperature exceeds 15 minutes at 1200°C and is longer still at lower temperatures. The time can be reduced by using a test-piece of smaller diameter but even with the 1-in. diam test-piece frequently used for high-temperature testing, the time exceeds 7½ minutes.

Under these conditions hot strength is entirely different. With the synthetic sand, no change in strength occurs until the temperature reaches 500°C. At this temperature, strength begins to rise, at first slowly and then more rapidly, reaching a maximum at 1000°C, followed by a rapid fall. By the time 1200°C is reached, strength is much lower than its original value. The full strength/temperature is shown in Fig. 4. The maximum strength is some five times the dry strength at room temperature.

The existence of such a peak in hot strength measured under these conditions has been noted by a number of observers. The reasons for the great difference in behavior between rapidly and slowly heated test-pieces become clear if the effect of heat on clay is considered.

Effect of Heat on Clay—When strongly heated, clay loses its combined water and undergoes a change in structure. When these changes have taken place, the clay does not regain its plasticity on the addition of water. If, therefore, a clay-bonded sand is heated until the combined water has been completely removed from the clay, and the sand then is cooled and remilled with water, its green strength must be negligible. Also, if clay is heated alone until its combined water is removed and then is added to a silica sand and milled with water, the green strength again is negligible.

When clay-bonded sand undergoes prolonged heating, its strength rises. Whether the increase is due to the loss of combined water from the clay and to the structural change which accompanies it or to some other change is unimportant. It is unlikely, however, that the increase in strength can precede the loss of combined water since the higher strength is maintained however long the same clay is kept at the testing temperature. The possibility that the change in the clay which caused the increase in hot strength occurs first and that such a radical change as the loss of combined water and complete alteration of structure can occur later, without in any way affecting strength, is so remote that it can be ignored. The loss of combined water and of the ability to regain plasticity on the addition of free water therefore must precede or accompany the increase in strength.

It can be shown readily, without any special apparatus, that loss of the ability to regain plasticity on milling with water does not occur rapidly even at temperatures as high as 900°C. A flat dish or plate of high-heat capacity is placed in a furnace at the required temperature and allowed to soak. A thin layer of clay then is sprinkled onto the surface of the dish. As soon as the clay reaches furnace temperature, which can be judged visually, it immediately is discharged onto a cold slab. In this way a sample of clay which has been heated to the testing temperature for a few seconds only is obtained.

When this procedure is repeated until sufficient clay is obtained to carry out a bonding test, the

clay which has been heated differs little from the original. Since the increase in hot strength must either accompany or follow the loss of combined water and green bonding properties, it cannot proceed with great rapidity.

By such means it was possible to show that the increase in hot strength in a clay-bonded sand which had been heated rapidly and tested as soon as the testing temperature had been reached must be appreciably less than the increase when the sand was heated slowly or allowed to stand for some time at the high temperature.

Hot Strength of Sand on a Mold Surface—In view of the great difference between the hot strength of sand heated rapidly and tested as soon as the required temperature has been reached and that of the same sand heated by soaking in a hot furnace, it is important to decide which method

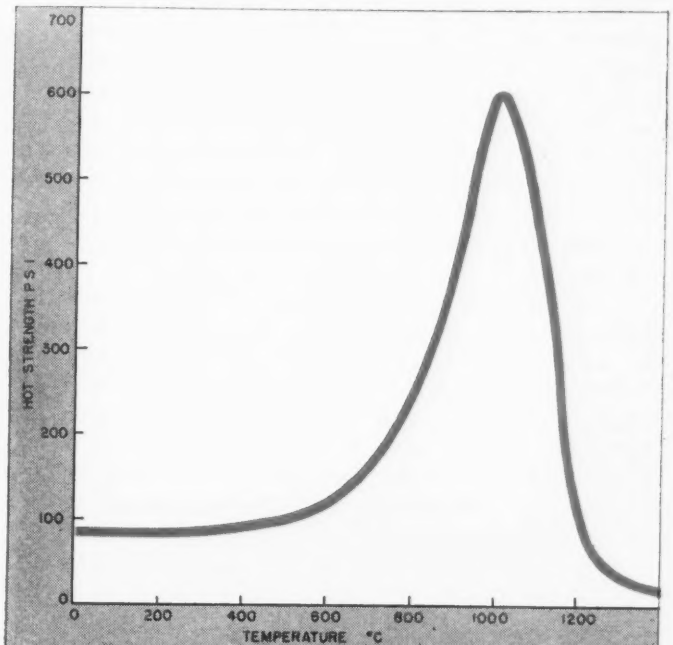


Fig. 4—Maximum strength of synthetic sand is five times the dry strength at room temperature

of testing describes more nearly the properties of the sand on the surface of a mold during pouring.

Sand heated by the first method shows very little change in strength until fusion of the clay commences, and hot strength therefore is the same as cold dry strength, and measurement of hot strength is unnecessary. Sand heated by the second method becomes increasingly strong with a rise in temperature, the maximum in the case of bentonite being about five times room temperature dry strength. It seems unlikely that such a change in strength, or in some other property which may be affected by the same cause, can occur without affecting the behavior of the sand on the surface of the mold during casting.

Direct determination of the temperature of the sand on the mold surface during pouring is difficult, but precise knowledge of this temperature is not necessary since an upper limit to the possible hot strength can be obtained by other means. The pouring time for a casting which can be poured safely in a green sand mold rarely exceeds 2 minutes. If during that time the temperature reaches 950°C, the rise in hot strength of a bentonite-bonded sand will be similar to that shown in Fig. 2 at 950°C—that is, from 115 psi to 125 psi. If the mold surface is heated to a lower temperature, the rise in strength will be less.

If, as usually occurs, the mold surface is heated more rapidly, then when the temperature reaches 950°C, the sand will have been at each temperature for a shorter interval than the sand in Fig. 2. Again, the increase in hot strength must be lower than the maximum shown in that figure. Unless the temperature of the face of the mold can be prevented from rising farther, this lower value is the maximum hot strength, since strength begins to fall at 1000°C.

The high hot strengths which appear when a clay-bonded sand is tested after a long heating period cannot, therefore, occur in the surface layers of a mold during pouring, and high frequency heating equipment can be used to set a maximum to the hot strength, provided that the rate of heating of the mold face is not less rapid than the rate of heating in the testing equipment. In sand bonded entirely with bentonite, the maximum hot strength of the mold face cannot exceed room temperature dry strength by more than 10 per cent, and the difference is usually less. It is difficult to control the dry strength of a foundry sand to closer limits than ± 10 per cent and the change in strength during pouring can be ignored.

The hot strength of the face of a bentonite-bonded mold therefore is approximately equal to the dry strength at room temperature.

Effect of Some Organic Materials—When an organic material such as wood flour or seacoal is added to a clay-bonded sand, dry strength at room temperatures may or may not be affected greatly. The addition of 2 per cent of wood flour, for example, to the silica-sand/5-per-cent-bentonite mixture used in the hot strength tests reduces dry strength from 110 psi to 75. The addition of 5 per cent of very fine seacoal increases dry strength from 110 psi to 175. Since the water requirement of the sand also is affected by the addition, and since dry strength depends very much on moisture content before drying, the true effect on dry strength can be obtained only by comparing dry strength/moisture curves. In general, however, wood flour and fibrous materials reduce dry strength, and granular materials such as seacoal increase dry strength if their grading is very much different from that of the sand. Otherwise, they have little effect.

When a test-piece containing organic matter is placed in a hot furnace and allowed to soak until a uniform temperature is reached, the organic matter on the surface layers is completely burned, leaving cavities containing any ash which remains.

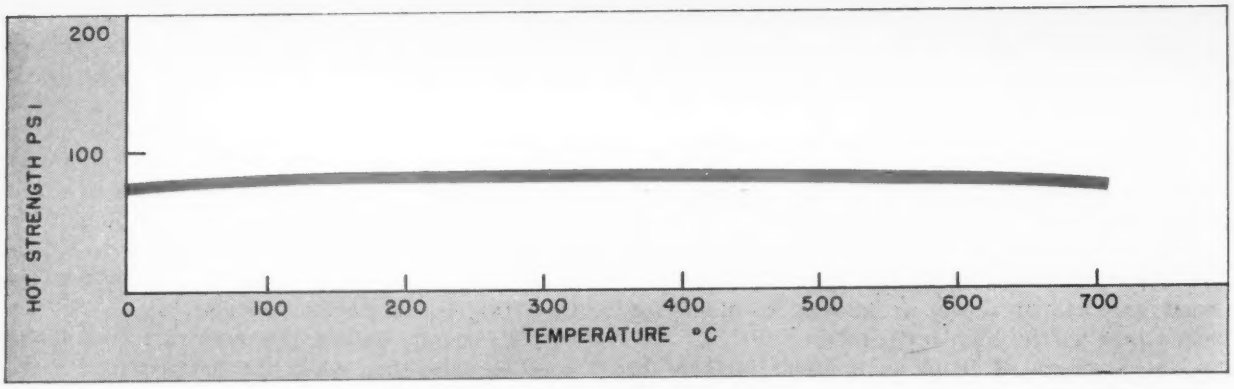


Fig. 5—Silica sand with 2 per cent wood flour was bonded with 5 per cent bentonite. Hot strength was constant at temperatures up to 700°C reached in less than 1½ minutes

In the interior, any volatile matter is driven off, but the fixed carbon will remain, owing to lack of oxygen for combustion. The depth to which complete combustion takes place depends on the ease with which air can diffuse into the interior of the test-piece and replace nitrogen and the gaseous products of combustion—that is, on the time of heating and the permeability of the sand. In any case, the cavities must be a source of weakness, and the hot strength of a sand containing organic matter is always lower than the hot strength of the same sand free from organic matter under such conditions of testing.

When the sand is heated rapidly, there is not sufficient time for evolution of volatile matter to be completed, and, owing to the envelope of reducing gas covering each grain of the test piece, combustion of fixed carbon does not take place at all. In the tests so far carried out, a test-piece of sand with 2 per cent of wood flour has been raised to 700°C in less than 1½ minutes, and the evolution of gas was never complete. Indeed, the rate of evolution could be seen to increase continuously up to 800°C when heating had to be discontinued because, owing to the gas and the resulting flame, flashing-over occurred. It will be necessary to modify the apparatus to permit tests on sands containing organic matter to be carried out at temperatures over 700°C.

With rapid heating, the hot strength of sand containing organic materials again is different from that of the same sand heated slowly. The organic materials can be divided into two classes: 1. Those which decompose without softening, such as wood flour, and fibrous materials such as straw, seed husks and flax fiber. 2. Those which soften before or during decomposition, such as pitch and seacoal.

The effect on hot strengths of the two kinds of material is entirely different. Different members of the same class may have effects which may be identical or which may differ in detail, although there is a general similarity. For example, consider the effects of wood flour and seacoal.

Effect of Wood Flour—Hot strength of silica sand bonded with 5 per cent bentonite and containing 2 per cent wood flour is shown in Fig. 5. At all temperatures up to 700°C reached in less than 1½ minutes, there is no change in hot strength. Owing to the limitation of the equipment, it was impossible to continue testing beyond this point with any degree of certainty, although occasional samples exceeded 800°C before a flash-over occurred and heating stopped. In these instances there was no change in hot strength. It is possible, therefore, that as the temperature approaches 1000°C, there may be a change in hot strength as a result of further decomposition of the wood flour.

It is unlikely that any great change in hot strength occurs in practice, since most green sand molds are poured in much less than 1½ minutes, and even the increased rate of decomposition in the higher temperature range is not likely to do more than compensate for the shorter time.

It can be concluded that *the hot strength of clay-bonded sands containing wood flour is the same as the dry strength at room temperature.*

Organic fibers such as straw, seed husks, etc., have effects on hot strength identical with those of wood flour.

Effect of Seacoal—The hot strength of synthetic sand with the addition of 5 per cent seacoal is shown in Fig. 6. At temperatures up to 400°C, hot strength remained constant at 175 psi, but as temperature rose farther, strength fell until it reached 140 psi at 700°C.

At a temperature between 400 and 500°C, seacoal begins to soften as some of its constituents begin to fuse. As the temperature rises, the amount of liquid increases and strength continues to fall.

From these tests it is not possible to say what the hot strength of the face of a mold containing seacoal is likely to be during pouring. As the temperature rises, more of the coal liquefies, and the viscosity of any liquid present falls, both of which factors tend to reduce strength; but as soon as any liquid is formed it begins to decompose, with the result that its viscosity increases while the amount decreases, tending to offset the reduction in strength.

The final balance between these opposing factors, which control hot strength, must depend on

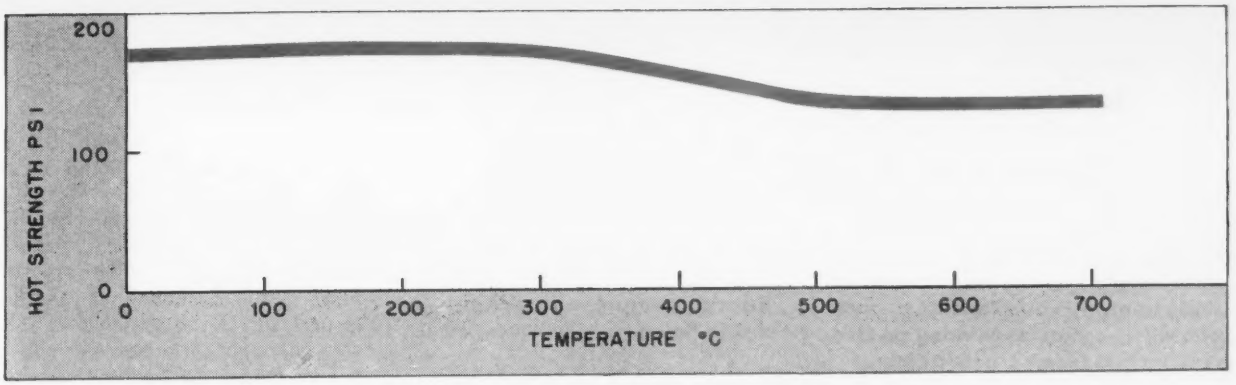


Fig. 6—With addition of 5 per cent seacoal to synthetic sand, hot strength was constant at 175 psi up to 400°C, then fell until it reached 140 psi at 700°C

the amount of seacoal present and on the rate of heating. It seems probable that the faster the rate of heating, the greater the fall in hot strength. some experiments with test castings seem to indicate that under suitable conditions hot strength can fall to a very low figure, but this reaction cannot be confirmed with the present apparatus.

Effect of Organic Binders—The factors controlling the hot strength of clay-bonded sands which also contain such binders as cereals, dextrin, molasses or sulphite lye are entirely different. When seacoal or wood flour are added to the sand, they have no bonding effect, but take part in the grain structure, and any effect on dry strength is only indirect. Wood flour, for example, reduces dry strength considerably. Seacoal may reduce dry strength slightly owing to dilution of the clay bond, or may increase it, the final effect depending on the relationship between the grading of the sand and that of the seacoal.

This effect is identical, however, with that which would be obtained if an equal number of silica grains of the same grading were added instead of seacoal. Partial decomposition of the individual organic grains such as may occur if the temperature of the sand is raised to 1000°C in 2 minutes or less has been shown to have no effect on hot strength unless some liquid is formed.

Organic binders, on the other hand, contribute to the dry strength, 1 per cent of dextrin more than doubling the strength of a sand bonded with 5 per cent of bentonite, and should even a small proportion of the organic bonding material be destroyed, there must be a reduction in strength. To obtain the hot strength of the sand on a mold face when the sand contains an organic binder, it would be necessary first to obtain the exact temperature cycle through which the mold face passes and then to reproduce that cycle in the test-piece. No attempt has been made to do this, and none of the conclusions apply to sands containing organic binders.

CONCLUSIONS—1. The hot strength of a sand which has been heated rapidly and tested as soon as the required temperature has been recorded is approximately equal to the cold dry strength until the temperature at which the most fusible constituent of the sand begins to soften is reached. Then strength falls.

2. The high hot strength found when a clay-bonded sand is slowly heated is due to sintering of the clay, which requires considerable time.

3. The temperature of the face of a mold rises so rapidly when a casting is being poured that there is no time for sintering to occur before the softening point is reached. Strength therefore remains almost constant until it begins to fall at the softening point.

4. The high hot strength present when a test-piece is slowly heated therefore is never found on the mold face, and it has no bearing whatsoever on the incidence of defects on the mold face or on its behavior in any way while the casting is being poured.

5. In a plain clay-bonded sand, the most fusible constituent usually is the clay, and the fall in strength begins when softening of the clay starts. With western bentonite this temperature is about 1000°C.

6. When organic materials which become part of the granular material and not of the bond are added, hot strength again remains constant until softening commences. Seacoal begins to soften at 400-500°C, and hot strength falls off at that temperature. Wood flour does not soften before decomposition, and hot strength remains equal to cold strength until the softening point of the clay is reached.

7. When it is required to know the hot strength of a clay-bonded sand, the simplest method is to measure the cold dry strength. This method is accurate up to 1000°C for plain bentonite-bonded sands or for the same sands containing wood flour, but only up to 400°C for sands containing seacoal.

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Questions and Answers

Procedure for using present wood patterns as masters involves application of expansion plaster . . . Leakage around the seat wall primarily due to lack of feed . . . Coatings to prevent sticking of chill . . . Plaster release agents . . . Shrink holes . . . Ornamental casting practice . . . Hard iron

Use Wood Patterns as Masters

QUESTION We are considering changing from our wood patterns to those made of aluminum alloy, and would like to know if there is some way whereby the former can be used as the masters instead of starting from scratch.

ANSWER Either of two types of gypsum or plaster of paris—termed high-expansion and medium-expansion—will permit use of your present wood patterns as masters to make aluminum patterns. The high-expansion type gypsum expands from 0.125 to 0.185-in. per ft and the medium-expansion expands from 0.120 to 0.140-in. per ft.

Expansion of the gypsums is controlled by the quantity of water added; highest expansion occurs with low amounts of water. These mixes do not flow freely and must be tamped into place. For best flowability select a gypsum which will give the required amount of expansion with the maximum amount of water.

Directions for mixing and handling expansion type gypsums are obtainable from the manufacturers and should be followed carefully. There are two methods. In one the gypsum is poured on the pattern, which has been coated with a release agent. The resulting cast or mold then is filled with a liquid slurry of high-strength, low-expansion plaster or gypsum, which constitutes in enlarged form the pattern for making the metal one.

In the other method a mold is made of a fine grade of green molding sand such as No. 00 Albany. Mold is rammed firm but not as hard as when producing a metal casting. Mold face is dusted with dry parting material, and then the expansion type gypsum is poured into the cavity. Resulting cast is the pattern from which the metal pattern is made.

Bibbs Leak Around Seat Wall

QUESTION Under separate cover we are sending four hose bibs and two cores. Bibs are made on a cope and drag machine in a 12 x 18-in. flask with ten patterns on a plate. Cores are made from Blackhawk F sand, and molding sand is Tennessee with moisture about 5½ to 6 per cent. Pouring range is 2150 to 2200°F. We are having considerable difficulty with the bibbs leaking around the seat wall, sometimes on the cope and sometimes on the drag. The bibbs are gated at the hose connection end and made of yellow brass.

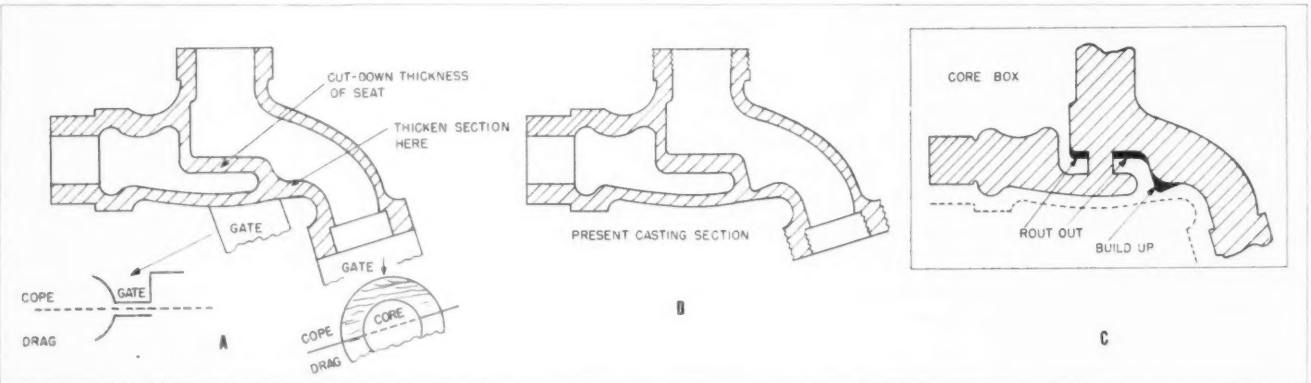
ANSWER Fracturing and examination of one of the bibbs shows the familiar feathery pine tree structure, with lemon yellow spots indicating shrinkage due to lack of proper feeding. Sectioning another of the bibbs shows the seat section considerably heavier than the surrounding walls, which themselves are not as uniform in thickness as they might be. You mention that the castings are gated on the hose end but do not state exactly where or the size of the gate.

As you know, feeding of heavy sections through thin sections usually is not successful unless chilling is applied to the former—and that hardly is practical or economical in this instance. Hence, the remedy will be to try to make the sections as uniform as possible, at least those of the seat area and the section between that and the gate. This is not too easy to do with existing pattern and corebox equipment, but may be accomplished by building up and routing out some areas of the corebox. This will decrease and increase the core thickness in the respective areas, with converse effects on the metal thickness.

The accompanying sketches show what we have in mind. The one marked *C* is the corebox and shows where build-up or routing out should be done to give the suggested changes in metal thickness. Instead of building up the corebox areas, appropriate change could be made on the pattern to increase the metal thickness. Sketch *B* shows the present thickness of sections, while *A* gives the suggested changes in thicknesses and indications of gate attachment.

Since you mention that you gate at the hose connection end, we assume that the attachment is as shown at the right. From that viewpoint the idea has been to adjust the metal thickness to provide good feed from the gate to the seat area. However, the other suggested gate, which enters close to the seat area, is a much better location because it feeds metal directly to where it is needed. Also the metal has a much shorter flow to fill the cavity.

Your pouring temperature seems somewhat high since yellow brasses are poured around 2050° F. Some



Sketches showing suggested changes directed toward correcting shrinkage problem located around seat wall of brass bibb

improvement might result by experimentally reducing the temperature 25° at a time until you reach the lowest range where solid castings without cold shuts are obtained consistently. Along that line, it might be better to pour from two small ladles than one large one.

Good Coating for Metal Cores

QUESTION We are thinking of substituting a piece of steel for a sand core in a gray iron casting, and would like to know if there is a good coating which may be applied to permit easy removal.

ANSWER A variety of coatings will prevent burn-on or seizure of steel or other metallic materials by molten gray iron. Any foundry supply house can supply a suitable agent.

Some foundrymen coat the chills with the same blacking used for sand molds and cores. Makers of cast iron car wheels coat the chills forming the treads with a paste formed by mixing 12½ lb red iron oxide with 1 gallon of special moisture-free heat-resisting oil. Graphite and red talc also are used. Another practice is to coat the chills with core oil, roll in fine silica sand or silica flour and bake.

One foundry, instead of using steel or iron rods to form a hole in a gray iron casting, employed an alloy iron containing 14 per cent Cu, 7 per cent Ni, and 2 per cent Cr. This material expands more than cast iron, and after the casting cools the chill is easily removed.

Plaster Mold Release Agents

QUESTION At various times we have seen references to release agents for use in plaster molding, but at the moment cannot locate any of them. Can you tell us what materials are used for that purpose?

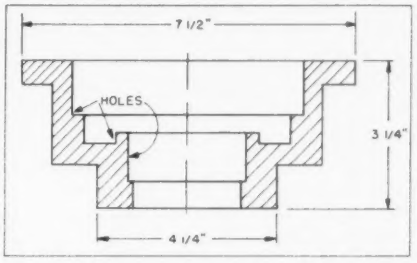
ANSWER Published literature indicates that a wide variety of release agents are used in plaster molding. They include potash (green) soap solution, lard oil, paraffin oil, light lubricating oil, ¼-lb stearic acid in 1 pint kerosene, petroleum jelly thinned with two parts kerosene, and one part light oil plus three parts kerosene and 1 per cent wetting agent.

Generally the use of one of a number of proprietary release agents available is preferable to experimenting. Only a thin coating of the agent should be applied. Spraying is preferred, and be sure the liquid does not accumulate in pockets and corners.

Shrinks Cause Casting Holes

QUESTION We are sending you a gray iron casting for examination. You will note the gas holes or shrinkage. We will appreciate some information on the cause of this defect since we get quite a few bad castings of this kind. We use a charge consisting of 400 lb pig iron contain- 2.40 to 2.50 per cent Si, and 600 lb scrap. Bed is 45 in. high in a cupola lined to 48 in.

ANSWER In our opinion, the holes in the casting are the result of shrinkage and not gas. While you did not mention the position of the casting in the mold or how it was gated, it appears that it was poured small end down, with a small flat gate opening into the upper flange,



Location of shrink holes in casting

and the holes almost opposite the gate.

A deeper gate might improve the feeding, but we believe a better procedure would be to place a sprue in the center with three or four branch gates opening into the lower part of the cavity. Possibly an even better practice would be to mold it with the large end down. This would leave the high mound of sand on the drag instead of hanging from the cope. Gate from the center as mentioned.

Ornamental Casting Practice

QUESTION We produce highly ornamental bronze castings and would like to have information on the best pouring temperature for the 85-5-5-5 alloy. If molasses is used to saturate the face of the cope and drag, what should be the proportions of molasses and water? What type of facing should be used on the drag? In skin drying is it preferable to use charcoal on a plate or infrared lamps?

ANSWER So far as we know there is no specific pouring temperature for the 85-5-5-5 alloy which will be suitable for variations in section thickness, method of gating, etc. Usual range is 1950 to 2250°F and, with extremely thin sections, as high as 2400°. Best temperature range for a given casting should be determined by several experimental pourings.

Spraying the mold faces with molasses water is common practice with many ornamental founders. Primarily it provides a more strongly bonded surface for skin drying, and also is believed to result in a better surface on the casting. Usual mixture is 1 part molasses in 15 parts water. Your expression "to saturate the face of the cope and the drag" is not quite clear to us. If the face is too wet it will slough off, and if made just damper than necessary, it takes too long to dry. One suggestion is to use about 2 qt of molasses water to a mold face 20 x 30 in.

Facing sand mixtures probably are as numerous as foundrymen. A suggested mixture of 40 parts sand with 1 part corn flour is said to serve satisfactorily for ornamental work. Usual method of application is through a fine sieve or riddle from a considerable height, followed by the coarser backing sand.

For skin drying, infrared lamps would be much healthier and cleaner than use of charcoal on a plate, and the heat applied would be more uniform and controllable. Banks of lamps on 6-in. centers could be set up in frames to cover desired areas. By making adjustable the distances of the lamps from the frames, varying contours of the mold faces could be accommodated.

Ladle Additions Soften Iron

QUESTION We are operating a 36-in. cupola on 600-lb charges composed of 50 per cent pig iron containing 2.75 per cent Si, and 50 per cent No. 1 foundry cast scrap. We would like to obtain about 1500 lb or more of good machinable castings a day. Could we make that by using additions in a 1000-lb ladle, and what should we use?

ANSWER Your present mixture shows from 2.10 to 2.15 per cent Si content, which evidently is not sufficient to give the desired machining quality. While section thickness of the castings involved is not mentioned, we assume that it is thin, and the difficulty primarily is from hard edges.

If the condition is not too severe, it can be overcome by ladle additions of graphitizing elements of which a number are available. These include coarse graphite, ferrosilicon, nickel-silicon, silicon-titanium-calcium, silicon - manganese - zirconium, etc. Amount of the specific material to be added must be determined by experiment and will depend upon re-

sults desired. Various firms producing such graphitizing agents publish literature on use of their materials, and their names and address may be found in the advertising pages.

If your iron is sufficiently hot, you can make the additions in ladles as small as 100-lb capacity.

Steel Practice Is Different

QUESTION We are producing manganese bronze propellers and want to make them in stainless steel also. We have experience with gray cast iron, but none whatever with steel. We want to conduct the steel operations with the same personnel we now have, and would like to secure all the necessary information on steelmaking so that we may proceed with the production of stainless steel propellers.

ANSWER Since the practices employed in production of steel castings differ considerably from those used for nonferrous and gray iron castings, we suggest that you engage someone who has had the requisite experience to set up the steel casting department and get it functioning properly. Perhaps before you go much farther with your idea, it will be well worth your while to get a copy of *Metallurgy of Steel Castings* by C. W. Briggs. This describes various phases of steel castings production, and will indicate clearly our opening remarks about difference in practices.

Defect Caused by Mold Gases

QUESTION We are forwarding for your comments some gray iron castings with which we are having trouble from porosity. It seems to be confined to the drag section and in the heavier sections, and in those with and without cores. In cored castings the trouble occurs around the prints. We use all-scrap charges and endeavor to eliminate wet sand, wet ladles and cupola spout, etc. Iron temperature appears satisfactory. With cold iron and wet sand the defect does not appear, but it does with hot iron and dry sand. We use seacoal, and wonder if the trouble is due to that.

ANSWER It is our opinion that the defective castings result from the inability of the gases generated by contact of sand with the molten metal to escape rapidly from the drag section of the mold. Possibly the bottom boards are rubbed on too tightly or the mold is rammed hard. Mention of your experiments with cold and hot iron seems to point to a borderline case. Cold iron and wet sand cause the iron to freeze or solidify quickly while hot iron and dry sand slow down the rate of solidification and result in a thin skin easily penetrated by external gases.

We suggest that after the bottom board is rubbed on it be removed and a number of scratch vents made across the sand to the edge, and then the board replaced. If the mold is struck off before placing the bottom board, make the scratch vents after striking off. If that does not help, try using a vent wire in the affected areas. Softer ramming also might be tried. As you indicate, presence of too much organic or gas forming material in the sand is a possible cause, but it would be our opinion that such a condition would result in defective areas all over the castings, and not be confined to a specific section.

Difficulty in Removing Cores

QUESTION We are having considerable trouble in obtaining a suitable core mix for aluminum alloy fittings. Our present cores have to be chiseled out of the castings. Can you suggest one which will be satisfactory, giving the amounts of sand, flour, oil, etc.?

ANSWER Without knowledge of your present mixture for cores or the size of the fittings we cannot suggest what to do to eliminate the difficulty in removal. Possible causes are incomplete baking, too high a binder content, and use of too much clay-containing sand.

Reduce the binder content to the point where the cores disintegrate easily but still are strong enough to be handled. Possibly a sand mixture containing 100 parts of clay-free silica sand by volume, 1 part core oil and 1 part cereal will serve your purpose.

Kettle Has Scabbed Interior

QUESTION We recently tried to make a cast iron melting pot or kettle for lead alloys. It was 32 in. in diam at the top, had a 6-in. flange and was 18 in. deep. We made it with the flange down so that the pattern left its own core on the drag. When we removed the casting from the mold, the inside was scabby. Can you suggest how to produce this pot casting with a smooth interior?

ANSWER Presumably this is your first attempt to make a casting of this type, and the scabbing probably was due to hard ramming, lack of sufficient venting in the large mound of sand on the drag or a combination of both.

Usual procedure for molding such work is to place the pattern mouth up in a light follow board frame or, in an emergency, in a false cope. A 6-in. layer of sand is placed in position and tramped off with the feet—*not rammed*. This is followed with another 6-in. sand layer similarly treated. Final 6-in. course of sand is lightly butted to provide firmness. Then the drag flask is placed in position, filled with sand, struck off, and the bottom board rubbed into place.

Board is removed and the mound of sand in the center of the pattern is vented thoroughly with a ¼-in.-diam vent rod or wire. Generous channels are cut in sand between drag and bottom board. Instead of having a solid mound of sand, it might be advisable to make it hollow by use of a 6-in. plug. Succeeding operations of clamping, rolling over, ramming and lifting the cope are routine.

Gating will depend upon the characteristics of the molding sand. It may be through a wedge gate or through several pencil gates at the top, or by means of a long sprue with a semicircular runner containing three or four flat gates into the flange. Latter method is fairly safe with any kind of sand, but where the sand is weak, top gates should not be employed, since washing or cutting usually results. Washing can be overcome by "capping" the sand mound with a dry-sand core. The latter is made by ramming a 3 or 4-in. thickness of core said mix in the pattern and turning it out on a plate for drying or baking. Then the core is placed in the pattern, and molded.

Sand must be rammed firmly under the flange in the drag and over the flange in the cope. Unless the sand in those areas is extremely permeable, it will be wise to vent it to prevent kicking. Any disturbance of that type while the mold is being filled will show up on top of the casting as scabs and blows. Be sure to touch off the vents under the bottom board.

Causes Trouble in Polishing

QUESTION We are producing aluminum alloy castings and from time to time have castings which, after polishing, show fine porosity on the surface. This seems to occur once or twice a week. We are using oil-fired crucible furnaces.

ANSWER Fine surface porosity usually is an indication of gassy metal, and it will be advisable to give closer attention to melting conditions. Possible causes are 1) leaving the metal in the furnace too long after it is up to temperature or 2) heating to too high a temperature. Both lead to increased gas pickup.

Sometimes poor pouring practice which permits air entrainment results in such porosity. Again it might occur on days when the atmosphere is highly humid. The porosity might be overcome by using gases such as dry nitrogen or chlorine, solid degassing agents or the vacuum degassing process.

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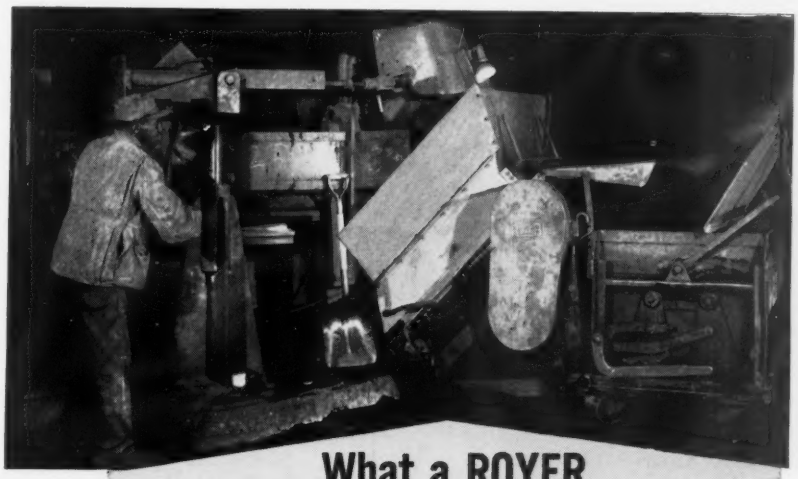
Finish it with a ROYER



Model NYS-E with a 9 ft. muller.

What a ROYER will do for your Mulled Sand

1. Increase permeability.
2. Increase flowability.
3. Eliminate all clay balls.
4. Provide a final complete mixing.
5. Double aerate the sand.
6. Speed cooling by fluffing, open discharge stream and open heap.
7. Assure a light, fluffy texture.

A Model NRS in a Massachusetts foundry.

The mulling operation, designed to coat sand grains with certain additives by the mechanical process of kneading, is an essential one for good sand control. However, this action results in pressing and packing the sand grains together and the added bonding materials tends to hold the sand in a dense state. Sand properly prepared for molding should be open and fluffy, to allow for good flowability and the escape of gases. Sand discharged from ANY muller needs to be aerated . . . with a ROYER . . . the only machine large enough to handle the instantaneous discharge from large mullers; the only machine which fluffs and cools as it aerates.

Install a Royer directly under your muller discharge or later in the system, if more convenient. Two models are recommended for this application, depending upon capacities desired—the NRS, 40 to 60 tons per hour or the NYS, 120 to 180 tons per hour. With the addition of a Royer no time is added to the cycle of sand preparation and, for a fraction of a cent per ton, the quality of your sand will be improved many times over. Write for complete details.

Foremost in Sand ROYER *Conditioning Equipment*

ROYER FOUNDRY & MACHINE CO. 159 PRINGLE ST. KINGSTON, PA.

MEN . . . of Industry

WALTER GRAMM
. . . becomes board chairman

JAMES L. YATES
. . . becomes district mgr.

KENNETH M. BARTLETT
. . . joins Horizons Inc.

JOHN M. ANSPACH
. . . De Laval foundry mgr.

WALTER GRAMM, senior vice president, Great Lakes Carbon Corp., New York, was elected chairman of its board of directors, succeeding the late George Skakel Sr. In 1919 Mr. Gramm helped organize Great Lakes Coal & Coke Co., Chicago, which later became Great Lakes Carbon Corp. **James C. Skakel,** with the company since 1943, was recently named a director. He has served in various capacities including the office of president, Great Lakes Corp., a company subsidiary.

William R. Butler was named manager of die casting sales, Aluminum Co. of America, Pittsburgh. He was graduated from Yale University and previously served in the Chicago, Milwaukee, Fairfield, Conn., and South Bend, Ind., sales offices. **Charles Braglio,** since 1949 assistant manager of the New Kensington, Pa., sales development branch, has succeeded Mr. Butler as manager of jobbing sales.

Philip C. Rodgers, former vice president in charge of the Metals Division, General Metals Corp., Oakland, Calif., was recently appointed works manager, Vulcan Steel Foundry there. Mr. Rodgers served as president of the Northern California Chapter of the AFS in 1951-52.

F. P. Benson Jr. recently joined McKinsey & Co., as a consultant in manufacturing in the New York home office. A graduate of University of Miami, Mr. Benson was previously a founder and partner in Shellcast Inc., Rahway, N. J., and from 1950 to 1953 was foundry engineer on the Paris staff of American Radiator & Standard Sanitary Corp. for the company's European plants.

James L. Yates was recently appointed district manager of the midwest territory, National Engineering Co., Chicago, succeeding **L. G. Probst,** who was named manager of Foundry Division sales. Mr. Yates left the company in 1950 after 4 years as manager of National's consulting section. For the past 5 years he was successively general manager-manufacturing, Inland Steel Products Co., Chicago, and works manager, Illinois Iron & Bolt Co., Carpentersville, Ill.

Kenneth M. Bartlett, formerly manager of research, Thompson Products Inc., Cleveland, was appointed executive vice president, Horizons Inc., Cleveland research organization. Mr. Bartlett was one of the founders and the first president of the Investment Casting Institute.

Goff Smith, lately executive vice president, was elected president, Griffin Wheel Co., subsidiary of American Steel Foundries, Chicago, succeeding **Edmund Q. Sylvester,** who resigned to establish a wheel manufacturing business in South Africa. **Ralph D. Brizzolara,** vice president-director of American Steel Foundries, was elected a director of Griffin Wheel Co.

Gustave Reichenbach, former owner of Aero Foundry Co., New York, has retired, after selling the foundry to **Paul Stibrany.**

John M. Anspach, formerly service engineer, Meehanite Metal Corp., New Rochelle, N. Y., was named manager of the foundry and pattern shop, De Laval Steam Turbine Co., Trenton, N. J. Previously he was associated with Lebanon Steel Foundry, Lebanon, Pa., and Pusey & Jones Corp., Wilmington, Del.

J. Clifford Merwin, for the past two years chairman of the board, Chain Belt Co., Milwaukee, has retired. Associated with the company for 38 years, he will continue as a director. **Brinton Welser,** since 1930 vice president-director of the company, was elected senior vice president. He joined the company 42 years ago after graduation from University of Wisconsin. **D. C. Slichter,** vice president, Northwestern Mutual Life Insurance Co., and a director of Pelton Steel Casting Co., Milwaukee, was also named a director of Chain Belt.

Dr. Douglas C. Williams has transferred from the Industrial Engineering Department to the Metallurgical Engineering Department, Ohio State University, Columbus, O. As an associate professor Dr. Williams will teach an introductory course in foundry science, a new addition to the metallurgical engineering curriculum.

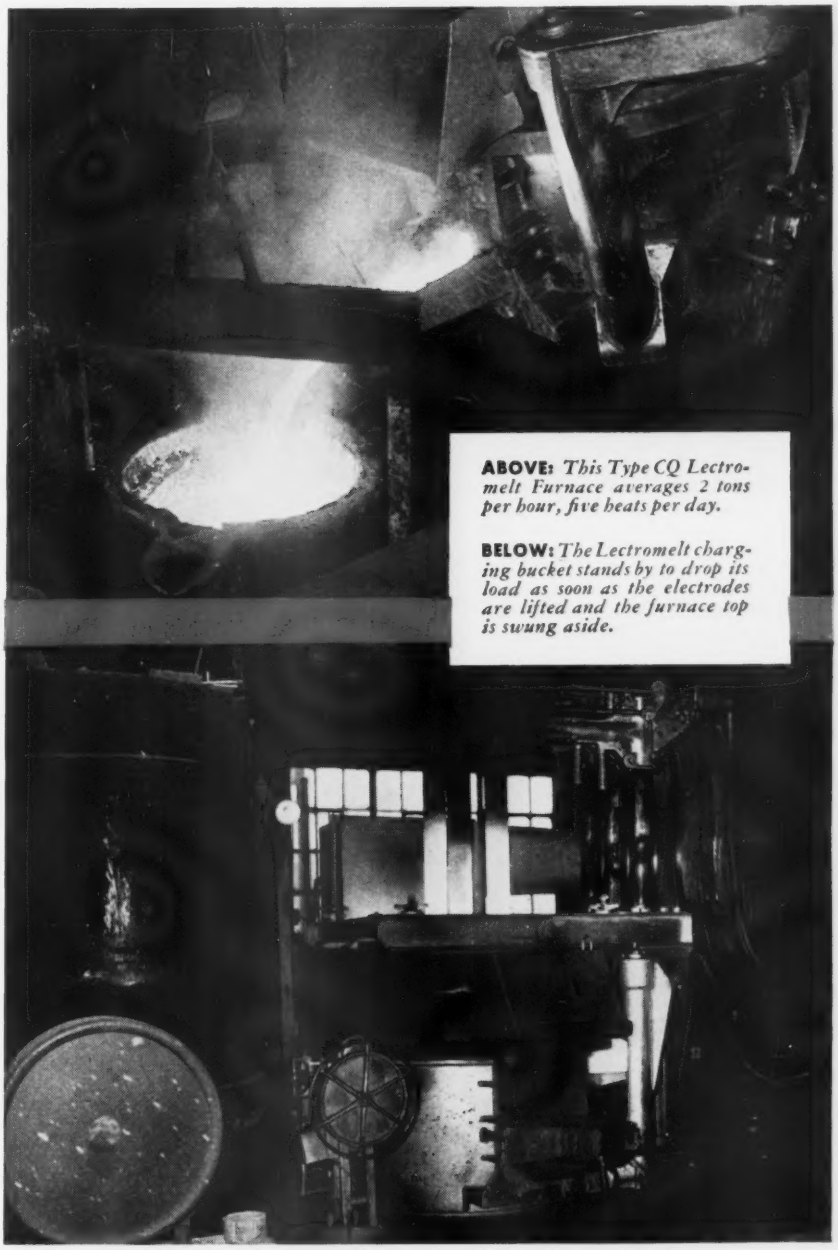
Thomas C. Harvey was named advertising manager with additional duties in sales engineering, United States Graphite Co., division of the Wickes Corp., Saginaw, Mich. After joining the company in 1945 he

"...found we didn't need our standby furnace because our new Lectromelt* keeps us busy"

"We're a steel jobbing foundry, casting miscellaneous carbon steels, so quick turn-around is important to us. Our new top-charged Lectromelt Furnace gets back on the line fast. It crowds a lot of heats into a day", says Mr. John A. MacKinnon, Purchasing Agent for Bay City Electric Steel Casting Company of Bay City, Michigan.

With a Lectromelt Furnace, small or large heats may be made as desired. Or part of a heat may be taken out and the analysis of the remainder altered as required to suit another specification. The ability to make any kind of ordinary or alloy irons or steel enables Lectromelt Furnace users to accept diversified orders—a distinct advantage to the jobbing foundry.

Lectromelt engineers welcome inquiries regarding your furnace requirements. For a copy of Catalog 9-A describing Lectromelt Furnaces, write Pittsburgh Lectromelt Furnace Corporation, 3143 2nd Street, Pittsburgh 30, Pennsylvania.



ABOVE: *This Type CQ Lectromelt Furnace averages 2 tons per hour, five heats per day.*

BELOW: *The Lectromelt charging bucket stands by to drop its load as soon as the electrodes are lifted and the furnace top is swung aside.*

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the sand additive that

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SAND-MEX pays seven ways:

1. reduces wear and abrasion on sand handling equipment
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4. produces better molds in less time
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THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

GARDNER R. LLOYD
. . . AFS Chapter Chairman

HOWARD P. CHACE
. . . retires, Norton Co.

F. KENWOOD JONES
. . . chief sales engineer

JOSEPH O. DANKO
. . . heads Chesapeake Chapter

served in Pittsburgh and Chicago, returning to the Saginaw office last year.

Gardner R. Lloyd, elected chairman of the Central Michigan Chapter of the AFS for 1955-56, is currently secretary, assistant treasurer and a director of Albion Malleable Iron Co., Albion, Mich. Mr. Lloyd was graduated from Cornell University in 1937 and spent three years in the Navy during World War II. He is a former director and secretary-treasurer of Central Michigan Chapter, and was its vice chairman last year.

Henry J. Barbour was named manager of advertising and public relations, Fairbanks, Morse & Co., Chicago, succeeding **L. A. Harlow,** who has resigned. Mr. Barbour has been with the company 31 years.

Robert L. Dietz has joined Claud S. Gordon Co., Chicago, as district manager in Cincinnati. A graduate of University of Cincinnati, he was formerly in the sales department of Radio Corp. of America, New York.

Howard P. Chace has retired as chief sales engineer, Grinding Machine Division, Norton Co., Worcester, Mass., after 44 years with the company. Joining the division as a time study man after graduation from Worcester Polytechnic Institute, he was master mechanic from 1914 to 1920 when he transferred to sales. **F. Kenwood Jones** has succeeded Mr. Chace as chief sales engineer. Mr. Jones was graduated from Worcester Polytechnic Institute and joined Norton Co. in 1940 after 4 years with Graton & Knight Co., Worcester, Mass.

Harold R. Lucas was made manager of the merchandise division, general sales department, Hyster Co., Portland, Oreg. A graduate of University of Oregon, for the past 6 years he was administrative assistant in Hyster's general sales department.

C. Eugene Silver was recently appointed sales representative, Herman Pneumatic Machine Co., Pittsburgh, to handle the company's line of molding machines in Texas, Louisiana and Oklahoma, with headquarters at 1214 Sterrett St., Houston 2, Tex.

Joseph O. Danko, elected chairman of the Chesapeake Chapter of the AFS for the coming year, is owner and president, Danko Pattern & Mfg. Co., Baltimore. A native of Austria Hungary, he came to the United States in 1904 and supplemented public school education with a mechanical engineering course, International Correspondence Schools. He worked in the U. S. Navy Yard, Washington, from 1917 to 1920, when he formed a partnership and started a pattern-making shop. In 1922 the business became Danko Pattern & Mfg. Co., and when it was corporated in 1952, he became president. He is also chairman of Arlington Bronze & Aluminum Corp., Baltimore. Mr. Danko was vice chairman of the Chesapeake Chapter last year.

James A. Turnipseed Jr. was named abrasive engineer in North and South Carolina, Tennessee,

ROBERT L. DIETZ
. . . joins Claud S. Gordon

HAROLD R. LUCAS
. . . division mgr., Hyster Co.

C. EUGENE SILVER
. . . Herman Pneumatic sales

JAMES A. TURNIPSEED JR.
. . . joins Bay State Abrasive

F. P. STRIETER
. . . AFS Chapter Chairman

EDMOND S. BAUER
. . . assistant sales director

THOMAS W. SEARS
. . . Monsanto sales mgr.

JACK C. THOMAS
. . . Sly northern Ohio sales

northern Alabama and eastern Arkansas, Bay State Abrasive Products Co., Westboro, Mass., with headquarters in Birmingham. A graduate of Alabama Polytechnic Institute, he was formerly associated with Sterling Grinding Wheel Co., Tiffin, O.

F. P. Strieter, who has been named chairman of the Saginaw Valley Chapter of the AFS for the current year, is superintendent of the die casting plant, magnesium department, Dow Chemical Co., Midland, Mich. A graduate of University of Michigan, he joined Dow's metallurgical laboratories in 1941 and became supervisor of casting research and development in 1946. He was transferred to the die casting plant in 1952 as assistant superintendent, and became superintendent last year.

Clement N. Williams was appointed assistant sales manager, Lewis-Shepard Products Inc., Watertown, Mass. Mr. Williams attended University of Pennsylvania and since 1947 was associated with Clark Equipment Co., Battle Creek, Mich., serving as New England sales manager for the past 5 years.

Edmond S. Bauer was made assistant director of sales for resin products, plastics division, Monsanto Chemical Co., Springfield, Mass. A graduate of Newark College of Engineering, he joined the division in 1942 as a research chemist and became sales manager for industrial resins in 1953. **Thomas W. Sears,** formerly assistant sales manager, has succeeded Mr. Bauer as sales manager. Mr. Sears was graduated from Harvard University and became an engineer in Monsanto's research department in 1946.

Robert H. Johnson was named sales representative, Norton Co., Worcester, Mass., in Florida and the southern portions of Georgia and Alabama. A graduate of Worcester Junior College, he joined the company in 1941 and was made an abrasive engineer in 1953. **Raymond B. Goodale,** formerly field engineer for the company in Chicago, succeeds Mr. Johnson as abrasive engineer in eastern Iowa. Mr. Goodale was graduated from Wesleyan University and since February was a field engineer in Chicago.

Jack C. Thomas was appointed Northern Ohio district representative, W. W. Sly Mfg. Co., with headquarters in the company's Cleveland home office. He was graduated from Ohio University and prior to working in Sly's sales department, was chief project engineer, Bryant Heater Division, Cleveland.

Donald V. Sarbach was named research director, Hewitt-Robins Inc., Stamford, Conn. He was graduated from University of Nebraska and previously spent 18 years with B. F. Goodrich Co., Akron, O.

Gilbert R. Stocum was appointed sales engineer in Illinois, Cleveland Vibrator Co., Cleveland, with headquarters in Chicago. He was formerly production manager-sales rep-

CLEMENT L. WILLIAMS
. . . joins Lewis-Shepard

ROBERT H. JOHNSON
. . . abrasive sales, Norton

RAYMOND B. GOODALE
. . . eastern Iowa sales

GILBERT R. STOCUM
. . . vibrator sales, Illinois

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26 MONTHS SERVICE

$.0056 REFRACTORY COST PER TON

5200 TONS OF METAL HANDLED WITH LINING OF **NOJOINT**

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HEAVY CASTINGS AND SPECIAL MACHINERY

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BIRMINGHAM 1, ALABAMA

U. S. A.

SERVICE REPORT
Ladle #3 - 12,000 lb. capacity
Lined Aug. 20, 1952
Relined Nov. 5, 1954
Refractory Cost $30.00
Type of metal - gray iron
A. W. Varnon
Foundry Superintendent

Mr. Varnon states that no maintenance or patching was ever done on the sides or bottom of the ladle. The *Ironton* NOJOINT was used exactly as received. Ladles with capacities of 14,000#, 18,000# and 30,000# — as well as numerous smaller ladles . . . lined with *Ironton* NOJOINT . . . have been in service for 12 months or more. None of these linings show signs of needing replacement yet. Competitive materials averaged *only one month's* service. Test and prove to yourself the value of *Ironton* NOJOINT in your own foundry.

IRONTON SERVICE ENGINEERS will be glad to supervise the installation of *Ironton* NOJOINT in your foundry. WRITE OR PHONE TODAY

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BOSTON, Mass. HAncock 6-1210	CLEVELAND, O. VUlcan 3-8200	LYNCHBURG, Va. Phone 2-8374	ST. PAUL, Minn. MIdway 9-6312
BUFFALO, N. Y. TAylor 2091	DETROIT, Mich. WOodward 3-8123	MIAMI, Fla. Phone 82-5782	SEATTLE, Wash. MAin 4330
CHATTANOOGA, Tenn. Phone 7-6697	HARTFORD, Conn. ADams 3-0941	MILWAUKEE, Wis. BRoadway 6-4790	SPOKANE, Wash. MAin 1644

resentative, Cenpro Corp., Northfield, Ill., and previously district representative in northern Illinois, Syntron Co., Homer City, Pa.

Harry E. Blumenthal, for the past 20 years representative of R. Lavin & Sons Inc., Chicago, was appointed executive vice president, American Iron & Supply, Minneapolis, in charge of sales and purchasing activities. Mr. Blumenthal was associated with War Production Board during World War II and is a director of the Twin City Chapter of the American Foundrymen's Society.

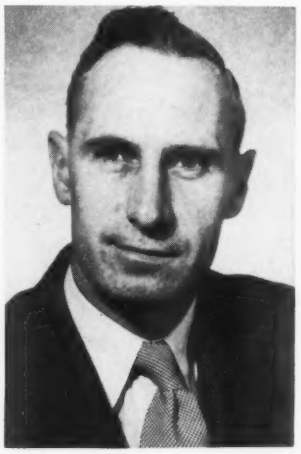
L. G. Danielson was appointed home office district manager, Industrial Division, Harnischfeger Corp., Milwaukee, covering Wisconsin and the upper peninsula of Michigan. Mr. Danielson joined Harnischfeger in 1935 and previously served in the Chicago and Milwaukee offices as sales engineer.

A. J. Kingseed was named assistant general manager, Farrell-Cheek Steel Co., Sandusky, O. **F. A. Kingseed** was appointed works manager, and **Alton Zimmerman,** assistant works manager.

John O. White recently joined Baldwin-Lima-Hamilton Corp. as sales engineer in the home office district, Philadelphia, with headquarters at the Eddystone, Pa., office.

Harold E. Schlenker was named vice president-sales, and **John W. Vanek,** vice president-engineering, Accurate Die Casting Co., Cleveland. Mr. Schlenker attended Fenn College, and joined the company in 1947 as a salesman. Mr. Vanek, who also attended Fenn, has been associated with Accurate Die Casting Co. since 1945, recently as chief engineer.

William C. H. Dunn, elected chairman of the Eastern Canada Chapter of the AFS for the current year, for 23 years has been associated with Western Pattern Works Inc., Montreal, which he helped organize. Born



WILLIAM C. H. DUNN
. . . heads AFS Chapter

in Montreal, he served his patternmaker's apprenticeship after leaving school. Active in the Eastern Canada Chapter, Mr. Dunn was its vice chairman last year.

E. W. Baumgardner was appointed sales manager, Trabon Engineering Corp., Cleveland. For the past 9 years he was associated with Industrial Ovens Inc., Cleveland, as chief engineer, until recently as sales manager. Previously he was a design engineer, National Carbon Co., New York.

James A. Barrett, chairman of the Central Indiana Chapter of the AFS for 1955-56, is chief engineer, Process Development Foundry, National Malleable & Steel Castings Co., Indianapolis. Mr. Barrett was graduated from Rose Polytechnic Institute and in 1932 joined National Malleable as a molder, subsequently becoming engineer, foreman, foundry superintendent and assistant general superintendent. He previously served as director and secretary of the Central Indiana Chapter and was its vice chairman last year.

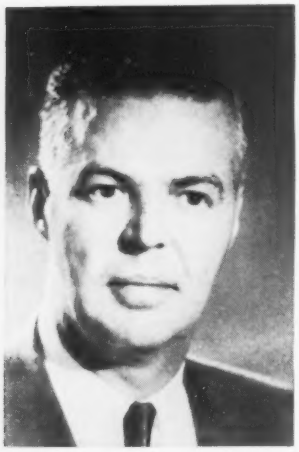
W. M. Champion, for over a year assistant sales manager of the Oklahoma City, Okla., office, Air Reduction Sales Co., New York, has been appointed district manager in Shreveport, La., succeeding **John Lund,** who has left the company.

Carter C. Chinnis was appointed Washington representative, National Research Corp., Cambridge, Mass. Mr. Chinnis, recently associated with the Washington office of Radio Corp. of America, will also represent Naresco Equipment Corp., equipment sales subsidiary of National Research Corp.

Chester G. Hawley was appointed general sales manager, industrial division, Jeffrey Mfg. Co., Columbus, O., succeeding the late Lincoln Kilbourne. **John Chrystal** has succeeded Mr. Hawley as manager of original equipment sales, merchandise division.

Norman K. Russell was appointed general sales manager, Richard C. Remmey Son Co., Philadelphia, maker of clay and silicon carbide refractories.

Donald R. Shaffer, formerly Long Island City, N. Y., manager, Hyster Co., Portland Oreg. has been made district manager of the north central district of the Eastern industrial truck division. A graduate of University of Oregon, he joined Hyster's sales promotion department in 1948.



HAROLD E. SCHLENKER
. . . Accurate Die Casting v. p.

JOHN W. VANEK
. . . engineering v. p.

JAMES A. BARRETT
. . . heads AFS Chapter

DONALD R. SHAFFER
. . . Hyster district mgr.

BY POPULAR DEMAND!

fine FANNER King Size

SCAB NAILS

with these "wanted" features

Cover FOUR TIMES the area, of conventional large head foundry nails

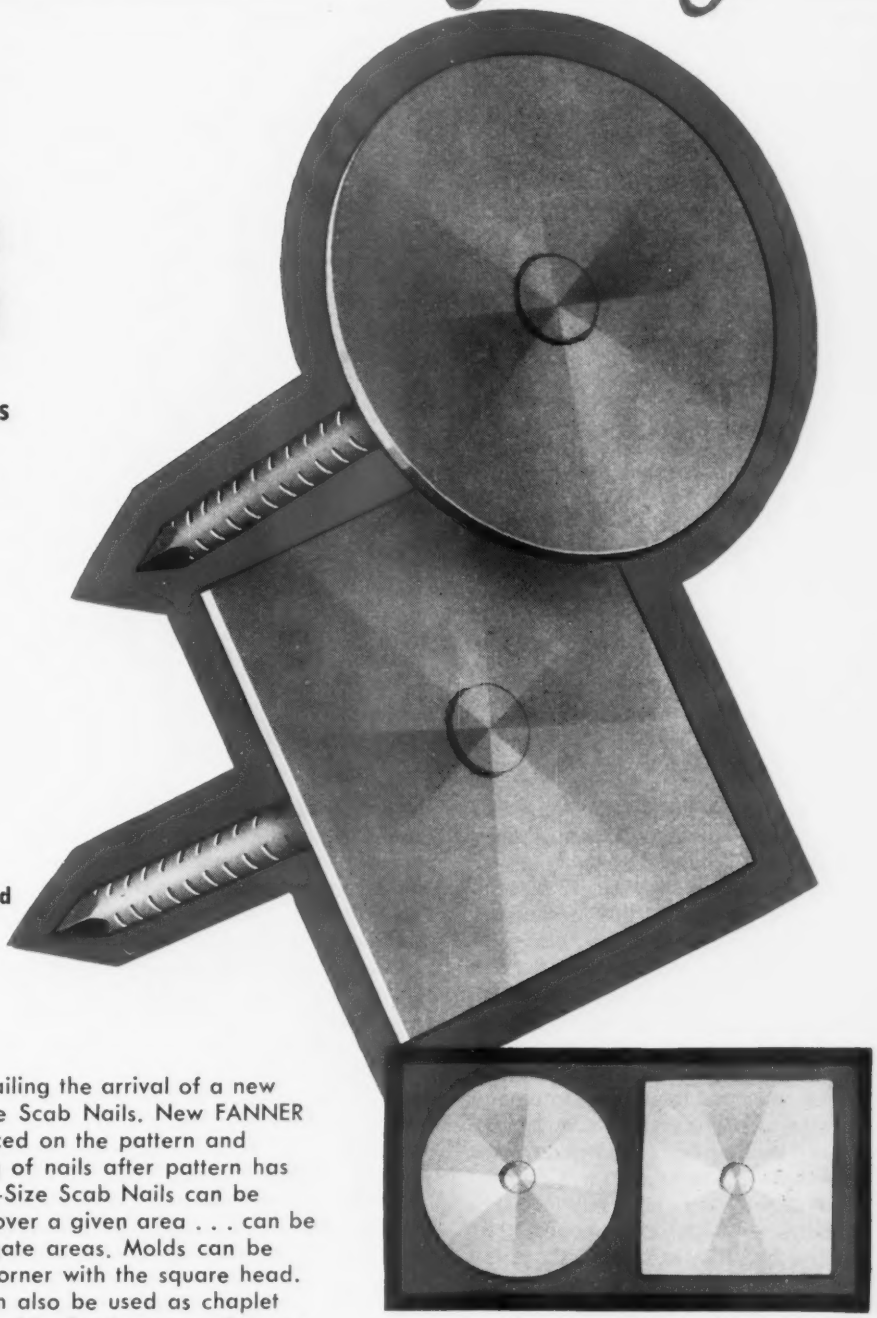
Requires 1/4 of labor-setting time

Lighter weight — more pieces per pound

Provides greater sand retention

Produce better castings

Available in 1" round or square head
Sizes: 7/8" to 2 1/2" long
Coppered or Tinned

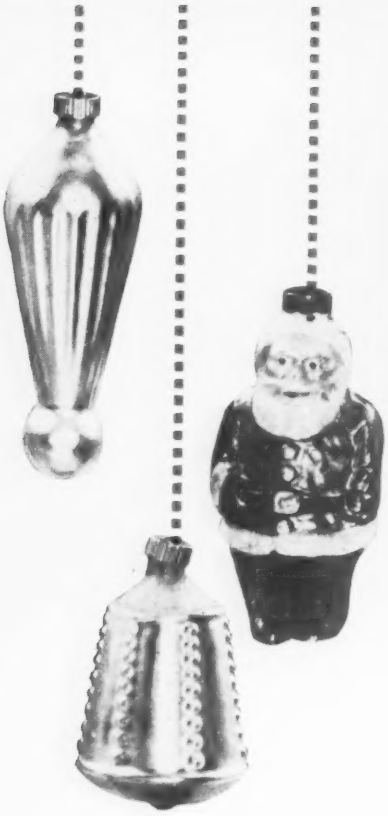


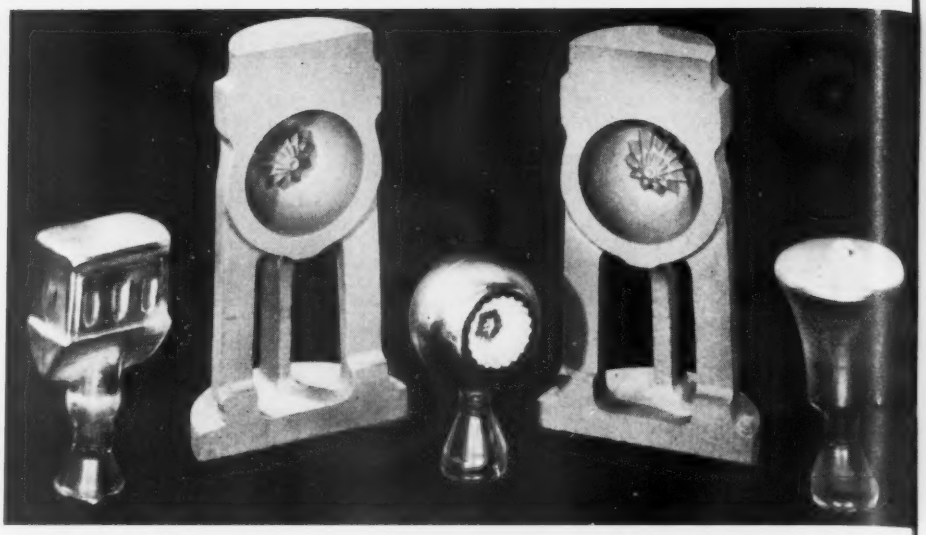
Fine FANNER King-Size Scab Nails shown here are actual size

● Foundrymen everywhere are hailing the arrival of a new "king" — Fine FANNER King-Size Scab Nails. New FANNER King-Size Scab Nails can be placed on the pattern and rammed, eliminating hand setting of nails after pattern has been rammed. Square head King-Size Scab Nails can be grouped together to completely cover a given area . . . can be used to excellent advantage at gate areas. Molds can be nailed or covered right into the corner with the square head. FANNER King-Size Scab Nails can also be used as chaplet bearing surfaces in green sand molds. For better castings at lower cost, use these new FANNER King-Size Scab Nails — write for samples and prices today!

THE FANNER MANUFACTURING CO.

Brookside Park **Cleveland 9, Ohio**





The two halves of an ornament mold are shown as they are delivered to the ornament maker. He will machine the mold faces and bases and also a channel at the top through which molten glass enters the mold. The ornaments are shown before the "sprue" has been removed

By ROBERT H. HERRMANN
Associate Editor

Ornaments . . . Start with a Casting

LATER this month, when you decorate the family Christmas tree, you will have a chance to examine another by-product of the foundry industry. Those ornaments you hang on the tree are blown in gray iron molds, and the chances are great that if they are domestic ornaments they were made at the Corning Glass Works in Wellsboro, Pa., in molds produced by American Brake Shoe Co., Engineered Castings Division, Rochester, N. Y.

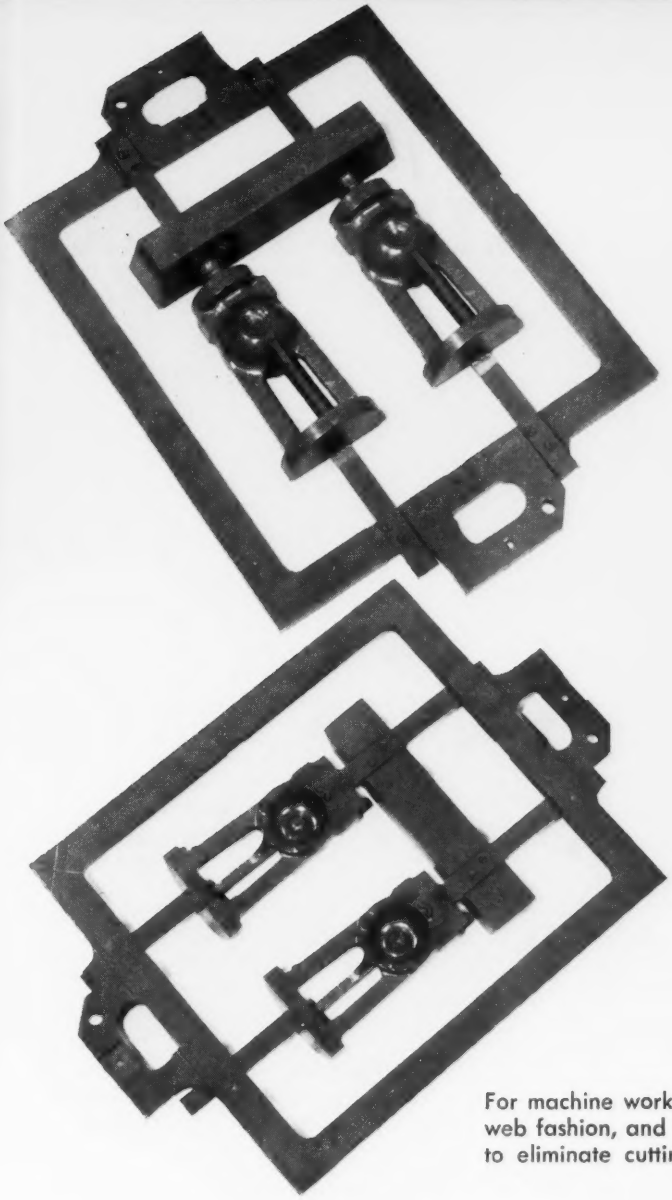
The casting of Christmas tree ornament molds is not a high-production job, but the requirements of surface finish and accuracy at the parting line of the mold cavity are high. By low production is meant that the foundry might cast three or four molds or as many as 150 of one design once a year. The number depends on how many ornaments of a particular design Corning wants.

Production Rate High—Production rate of the ornaments, however, is so high as to tax the imagination. These pretty glass baubles are made at the rate of about 1000 per minute per machine. Since, during the production run, the machines are operated continuously, the rate grows to 1,440,000 per 24-hr day per machine. At the end of a week a lot of ornamentation has been created. No matter if a few are broken in the process, these gewgaws fall like rain from the machines.

But that is two years ahead of our story. Corning works that far in advance on new ornament designs. The first step is to make a full-size wood pattern of the ornament. After sample castings have been made and designs approved, patterns are returned to Corning for refinement and pattern alterations for more economical production. This usually consists of making the pattern such that it can be mounted and, if necessary, of making a plaster corebox for producing the cavity core.

If only a few molds are needed, the corebox is eliminated and the cavity made directly in the pattern. Either the corebox or the pattern then may be rammed with synthetic molding materials developed by American Brake Shoe to make the fine detail in the cavity. Molds, if used without a core, are made with synthetic green sand. When cores are employed an altered material is used and dried in dielectric ovens.

Molding methods also depend on quantity of castings to be produced. If only a few are to be made, the patterns are used loose for individual piece molding. When matchplates are used for larger runs the patterns are mounted in a metal frame, spider web fashion. A hard sand match produced for the cope side of the pattern eliminates cutting a parting for each sand mold. The spider matchplate is laid on the match and a mold facing mixture of the synthetic ceramic molding material is rammed against the pattern face, which will form the mold surface making the outside of the ornament. Ordinary green sand forms the balance of the mold, which is rammed on a squeezer machine. The assembly is rolled over



Machine molding is used for making many ornament molds

For machine work, patterns are mounted in frames, spider web fashion, and a hard sand match is made for the cope to eliminate cutting a parting for each production mold

and the match drawn off. Pattern and drag are dusted with parting compound and the cope is rammed. Cope and pattern are drawn off; cores, if used, are set and the mold closed and set out for pouring.

A relatively fine-grain iron is used for these castings. Its approximate analysis is: C-3.35, Mn-0.70, Si-2.25, P-0.15 max, S-0.12 max, Ni-1.25, Cr-0.30 and Mo-0.50. Pouring temperature is 2800° F. Castings are cleaned with a light sand blast and shipped to the customer.

Corning machines the parting line and base and cuts a tapered channel at the top where the glass enters the mold during ornament production. The metal mold cavity is polished.

Forming the Ornaments — Ornaments are produced in what is called a ribbon machine. It gets its name from the fact that molten glass is fed to it in a thin ribbon. The glass flows through an aperture from the furnace to a series of steel plates about 3 in. wide, 6 in. long and less than ¼-in. thick. They travel in a horizontal plane affixed at one of the 3 in. ends to a chain conveyor which carries them in a long loop. The plates form a continuous metal conveyor on the straight sides of the loop and spread apart as they are carried around the drive wheels at the ends of the loop.

Each of the plates has a hole through the middle the same diameter as the channel cut in the tops of the ornament molds. The ribbon of molten glass is laid on the plates across these holes. The plates then pass under a pocket roll with indentations cut into its rim so as to meter a specified amount of glass. As the roll moves over the plates, it forms molten glass to the exact size, the indentations forming globules of glass over the holes.

Matching mold halves are mounted by their bases on a loop carrier, which moves them in a vertical plane under the plate conveyor. When the molds reach the bottom of the plates they are closed around the globule of glass which has begun to sag through the plate holes. A jet of air at a few ounces pressure is directed against the top of the glass globule, forcing it into the mold. The glass bubble takes the shape of the mold and solidifies without actually touching it.

The molds are parted and travel down from the plate conveyor and around to begin a new cycle. Solidified glass ornaments continue their travel, hanging upside down from the bottoms of the plates. An arm knocks them off to a conveyor, and the remaining ribbon flash slides off the plates to a chute as the plate conveyor turns to travel back to the starting point.

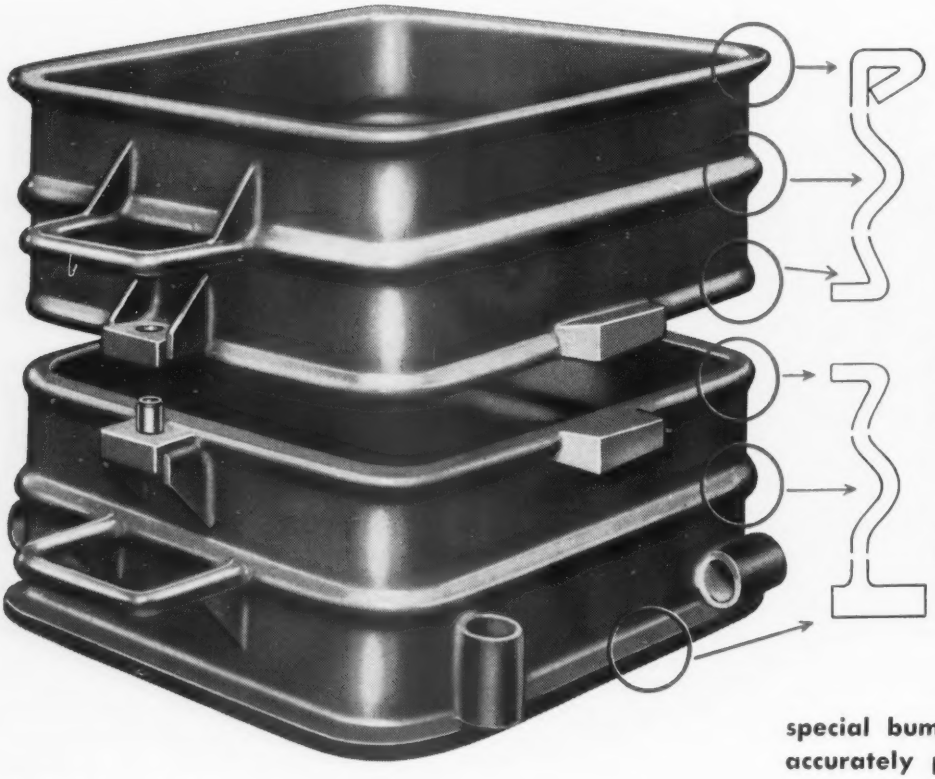
The ornaments are bulk loaded into cartons and shipped to other firms for painting and decorating. Surprisingly, little breakage occurs during handling. So why is it that when you are up on a ladder, bent over a Christmas tree, and one of the ornaments slips out of your hand, it breaks when it hits the well padded floor of the living room?

HERE'S *Custom Tailoring* IN STEEL FLASKS

Different foundry systems require different styles of Flask construction — the same Flask will not properly serve all molding and handling conditions.

The Flask shown here is a good example of Shanafelt "custom tailoring" in Steel Flasks. The reinforcement is varied to suit the need — flanges are designed and placed only where needed, thereby saving unnecessary cost and weight.

If you want your Flasks made to fit your own special conditions, just tell us your requirements and our engineers will work out the construction details.



This special flange gives added strength, a wide bearing surface, and a smooth rolled edge.

The Shanafelt corrugation adds strength to the sidewalls.

This Flask gets no beating at the parting, so these flanges were kept light to hold down the weight of the Flask.

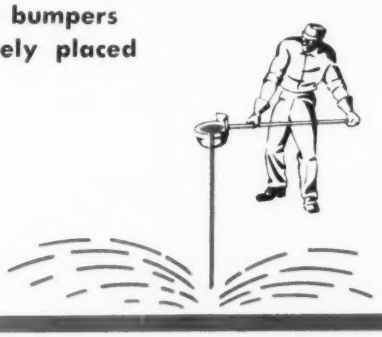
The way this Flask is handled, here is a hard service point. The heavy welded flange is extra wide to fit the conveyor.

special bumpers accurately placed

special stub pin with long head

special clamping lugs fit their standard clamp

special handles to make exact overall width to fit sling



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GIFS officers and directors. Standing, left to right: G. L. Nimocks, J. W. Simmons Jr., C. S. Wieland, A. M. Nutter, W. S. Brunk, E. T. White, E. M. Knapp and A. H. Renfrow. Seated, left to right: R. T. Lewis, Donald H. Workman, Henry J. Trenkamp, C. H. Ker, W. E. Illig, W. O. Larson

Market Expansion Discussed at

GRAY IRON FOUNDERS' MEETING

By FRANK G. STEINEBACH
Editor

ANNUAL meeting of the Gray Iron Founders' Society held at the Hotel Schroeder, Milwaukee, Oct. 20-21, was concerned chiefly with two main topics—namely, strengthening and expanding the market for gray iron castings and increasing the service of the society to the industry. The large number of members in attendance came away with the impression that both can be accomplished, given proper time and effort.

Charles H. Ker, Dalton Foundries Inc., Warsaw, Ind., was re-elected president of the society; J. Scott Parrish Jr., Richmond Foundry & Mfg. Co., Richmond, Va., was elected vice president; C. H. Meminger, Posey Iron Works Inc., Lancaster, Pa., will continue as secretary and Walter O. Larson, W. O. Larson Foundry Co., Grafton, O., as treasurer. New directors are as follows: A. H. Renfrow, Renfrow Foundry, Los Angeles; C. W. Wieland, Mid-City Foundry Co., Milwaukee; William Z. Taylor, Taylor & Co., Brooklyn, N. Y.; and J. Scott Parrish Jr.

Exceptional interest developed in the final report of the Program Evaluation Committee which was presented by C. R. Culling, Carondelet Foundry Co., St. Louis, and chairman of the committee. Mr. Culling emphasized that the committee is purely advisory and that the recommendations in the report, as well as those made in the report a year ago, have been submitted to the Board of Directors of the society for consideration. Action already has been taken on some of the recommendations.

Committee recommendations include the following:

Establish a real program of market analysis; assist members to make a real effort to sell consumers the ultimate value of castings rather than the initial price; promote more generally among users the idea that castings are precisely manufactured items, not a bulk commodity; find new uses for gray iron; advertise more widely; disseminate improved sales and promotional material to members; and use the program extensively in local management meetings to stimulate present groups and form new groups.

Give wider distribution to *Gray*

Society officers Charles H. Ker, president, Walter O. Larson, treasurer, were re-elected for 1955-56. J. S. Parrish Jr. is the new vice president

New directors elected at the meeting for three-year terms include, left to right: A. H. Renfrow, C. S. Wieland, J. S. Parrish Jr. and William Z. Taylor

John M. Price, right, is presented the society Gold Medal, its highest award for service to the industry, by Walter L. Seelbach

Iron News, the publication of the society, and other communications through mailings to one additional executive in each member company.

Limit activity in the field of foundry insurance to keeping members posted concerning various health hazards and risks involved.

Continue work of the committee on Terms and Conditions of Sale, with special stress on the extreme importance of the activity to the industry.

Start an annual survey which would incorporate the monthly summary and such other information as would be helpful in furthering the work of the Statistical Committee.

Revitalize the society's entire cost program by addition of staff assistance in the field and complete separation of local cost group and local management group meetings.

Change the by-laws to conform to the needs of an expanded program, and revise the dues structure to provide funds for greater service to members.

In the president's report, Charles H. Ker praised the many members of the various standing committees for the tremendous amount of time and effort devoted to the work of the society. In his visits to various society group centers from coast to coast, he was greatly impressed with the sizeable number of younger men who are attending and are asking questions. This development is excellent for the future growth of the gray iron industry, and the society.

In conclusion, Mr. Ker stated that 1955 probably will be recognized as a year of decision for the industry and the society. Future progress in both fields will be benefited from decisions which were made during the past year.

Donald H. Workman, executive vice president, discussed the need for improving communications between the society and its members. Efforts in that direction will include strengthening and making more effective the group and regional management meetings and the cost meetings. A number of highlights of society activities were reported by Mr. Workman, including a publicity program which is proving effective, preparation of data on gray iron for a story on the entire foundry industry, wage reports, national advertising and efforts to cut exportation of scrap. Mr. Workman warned that another national emergency would produce great problems in connection with metals.

Charles F. Walton, technical director, outlined his activities during the past year. The handbook continues to be the main technical project of the society. Mr. Walton explained that outside organizations were preparing chapters on "Design of Gray Iron Castings," "Machining and Grinding of Gray Iron," and "Properties." It is anticipated that the handbook will be entirely completed and ready for final acceptance by the board at the annual meeting to be held in October 1956.

A panel discussion, "How We Can Expand Our Markets," with Dr. Ira D. Anderson, president, American Marketing Association, and associate dean, School of Commerce, Northwestern University, Evanston, Ill., as moderator, attracted considerable interest, as evidenced by the questions at the end of the discussion. Robert J. Eggert, marketing research mana-

At the GIFS annual meeting are, left to right: W. J. Grede, Grede Foundries Inc.; Philip Frankel, Superior Foundry Inc.; Peter E. Rentschler and Peter R. Rentschler, Hamilton Foundry & Machine Co.; E. L. Roth, Motor Castings Co.

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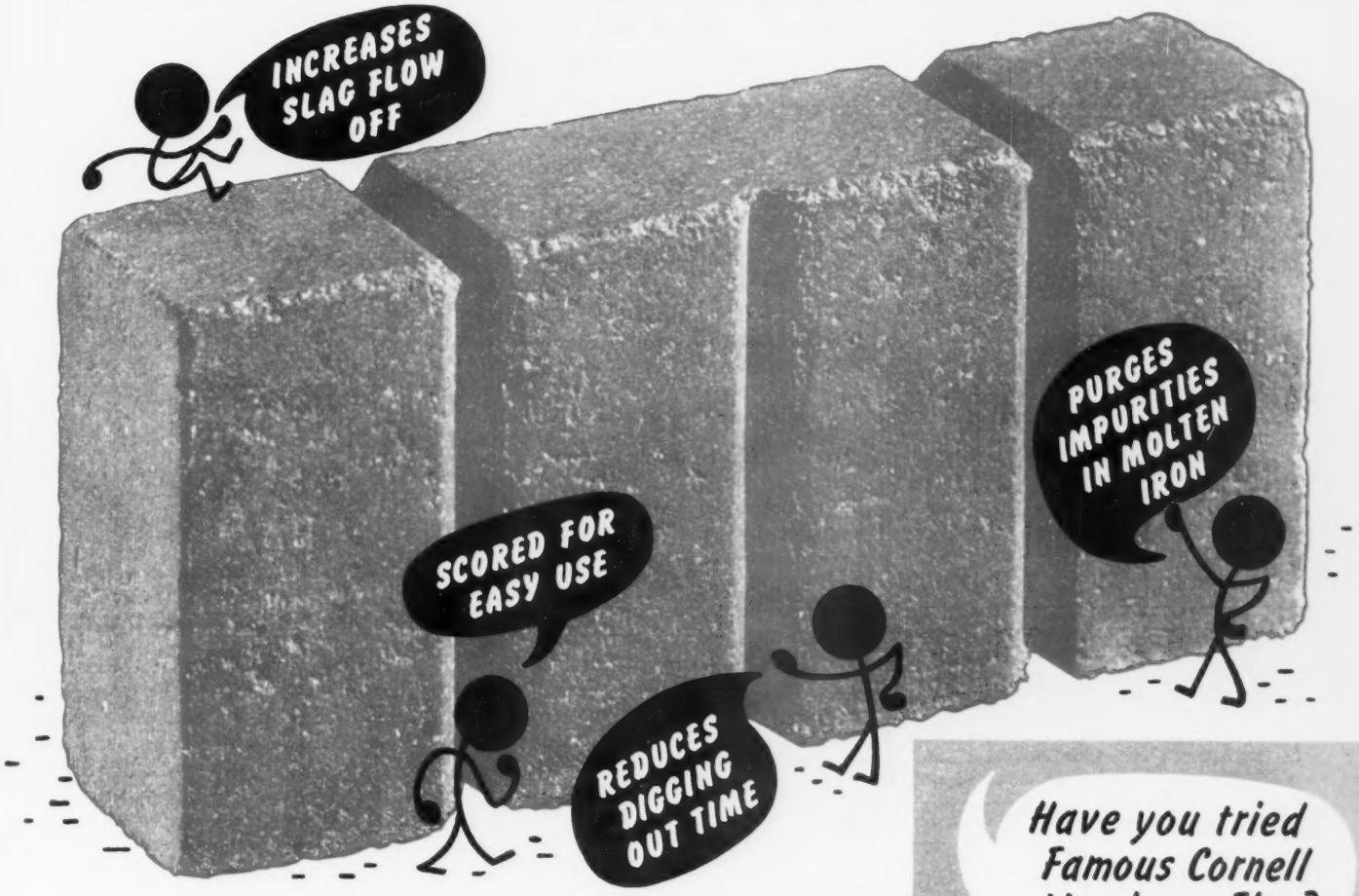

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MISHAWAKA, INDIANA

ger, Ford Division, Ford Motor Co., Dearborn, Mich., explained how his organization conducts consumer research in an effort to determine proper production facilities, style and other factors needed in the operation of the organization.

He stated that the utility of timely marketing information to management can be compared to the delivery of a second car to a stranded suburban housewife. Facts on consumer desires, opinions and actions presented in palatable form help management to make decisions and get action by removing the restrictive forces of unsupported opinion. A marketing research program has five "do's": 1. Discovery of major problems; 2. Defining problems in specific terms; 3. Development of research study details; 4. Distilling results for presentation; 5. Directing the findings into proper channels for action.

Associations Collect Reliable Data

Bay E. Estes, director, commercial research, U. S. Steel Corp., Pittsburgh, stressed the fact that data collected by trade associations from its members can be the most accurate and reliable source of marketing information for an industry and at the same time the least costly. To do this it is necessary that a large part of the industry's total volume be reported and that the coverage be well balanced geographically, by type of product, by the consuming industry served and by size of company. Furthermore, it is essential that members report accurately, promptly and consistently. Unless a summary can be put together on a set date with all reports in and with each succeeding tabulation having substantially the same coverage of members as the preceding one, the results will not be satisfactory.

Collecting statistical data on market coverage also should include a study of competitive products and an investigation of new markets. An adequate association program does not eliminate or reduce the need for competent marketing research within the companies which make up the industry. Rather, such a program tends to increase the value of such company activities and to multiply the contribution which can be made by a small but well qualified marketing research group. While the speaker did not suggest that every company should have a highly formalized marketing research organization, he did stress the fact that any company, large or small, in order to prosper or even survive in the competitive race, must, somehow, somewhere, with a significant degree of effectiveness, carry out the major marketing research function.

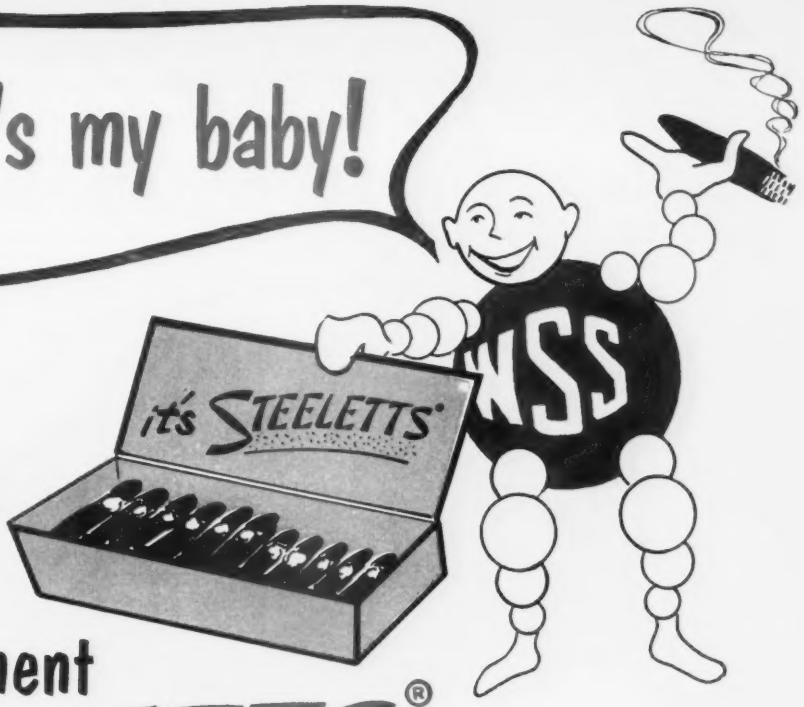
In discussing "The Top Executive Looks at Safety," Clifford L. Chatterton, Liberty Mutual Insurance Co., Pittsburgh, warned that both state and national governments continue to consider bills establishing requirements for safety work in industry. If top management wishes to police itself rather than have regulations forced upon the industry, it must understand safety, write specifica-

tions for the operation of the safety program and push the program through the entire plant. He pointed out that workers are happy who believe that management is interested in them as human beings and is considering their physical as well as their economic well being.

Mr. Chatterson spoke of safety work at a number of trade associations and indicated how group work leads to co-ordinated effort, avoids duplication, provides for an exchange of information and results in great improvement in safety. In conclusion, he outlined eight points of a safety program as follows: 1. Sustained management support and direction; 2. Adequate loss prevention work; 3. Active participation by supervision; 4. Effective employee education; 5. Control of accident hazards; 6. Adequate first aid and medical programs; 7. Regular inspection to detect unsafe working conditions; 8. Investigation of accidents to make certain that corrective measures are taken

Robert B. Hill, industrial engineer, Canada Iron Foundries Ltd., Montreal, Que., discussed "Cost Control, the Key to Increased Foundry Profits." Mr. Hill outlined what Canadian foundries are looking for and are finding in the cost control program of GIFS. He praised the help

Yes Sir, that's my baby!



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Steeletts retain their basic grit shape when used but the sharp edges become dulled. The grit shape imparts the matte finish essential for grit-blasted surfaces but the dull edges minimize the problem of embedment and reduce the wear and maintenance problems caused by the sharp fracturing edges of other grits. This, too, adds up to maximum economy.

For more information on Steeletts, send today for your copy of Bulletin 901-D. It's filled with valuable information on this new, long-life, high-speed, low-cost abrasive development.

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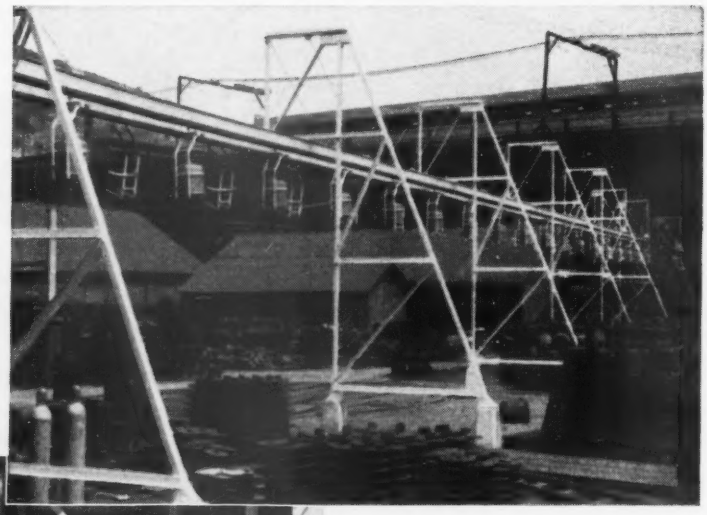

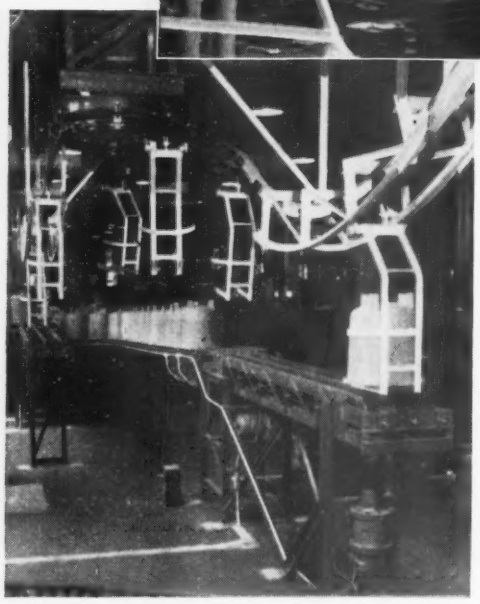

This trolley conveyer system with completely automatic receive and discharge stations, has been in the customers service for nearly 20 years, handling air brake reservoirs from foundry to machine shop.

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that the society has given its members in Canada and stated that as a result of the use of the program in a year when the general price level of castings was dropping, one organization was able to secure satisfactory increase in average selling price.

Lee C. Shaw, Seyfarth, Shaw & Fairweather, Chicago, presented an interesting and stimulating discussion on "1955—A Most Historical Year in Labor Relations."

At the banquet on the second day, John M. Price, chairman of the board, Ferro Machine & Foundry Co., Cleveland, was presented the gold medal of the society for his contributions to the industry and his work with the Office of Price Administration during the Korean war.

Citations in recognition of service to the industry were presented to C. H. Ker, president, Dalton Foundries Inc., Warsaw, Ind.; Earl H. Thompson, treasurer, H. P. Deuscher Co., Hamilton, O.; and Earl Paltenghi, vice president, H. C. Macaulay Foundry, Berkeley, Calif.

In the society's redesign contest, first prize was awarded to B. W. Johnson and C. E. Day of Aqua-Matic Inc., Rockford, Ill.; second prize, Frank K. Clifford, Olney Foundry Division, Link-Belt Co., Philadelphia; third prize, W. S. Thomas, Emmaus Foundry & Machine Co., Emmaus, Pa. Honorable mention awards were presented to William A. Morley, Link-Belt Co., Philadelphia; G. K. Stauffer, Reading Gray Iron Castings Inc., Reading, Pa.; and Norman J. Petitte, Superior Foundry Inc., Cleveland.

Conveyor Equipment Builders Elect Officers and Directors

Conveyor Equipment Manufacturers Association held its 22nd annual meeting at the Greenbrier, White Sulphur Springs, W. Va., Oct. 15-18. E. E. Boberg, vice president sales, Standard Conveyor Co., St. Paul, was elected president to succeed Jervis C. Webb, president, Jervis B. Webb Co., Detroit.

Other officers elected are J. H. Walker, Fairfield Engineering Co., Marion, O., vice president; Adrian W. Rich, Fairmont Machinery Co., Fairmont, W. Va., treasurer; H. E. Murken, Hewitt-Robins Inc., New York, secretary. New directors are D. E. Davidson, Link-Belt Co., Chicago; R. Y. MacIntyre, Continental Gin Co., Birmingham, and Frank J. Shude, Anchor Steel & Conveyor Co., Dearborn, Mich. R. C. Sollenberger continues as executive vice president.

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Man to Man

By RALPH L. LEE

The Five-Digited Sand Approximeter

"There's plenty of room yet to develop pocket instruments to measure sand—sand mikes almost as good as the human hand"

THERE'S no moral to this article, no plea for foundrymen to turn over a new leaf, no viewing with alarm or propaganda in any form. It's a testimony to the original designer and sole manufacturer of the most widely used sand testing apparatus in the whole wide world. In fact, it would be hard to imagine any foundry in the world that didn't use this device.

It's so portable it can be carried around in the pocket, lasts a lifetime if you're careful with it and grows more sensitive with thoughtful use. This marvelous instrument is none other (fanfare please) than the old, reliable, five-digited sand approximeter, the human hand (applause please).

Many years ago, while puttering around in the foundry of a friend of mine, I found a full set of sand laboratory testing equipment gathering dust (a full quarter-inch) in the catch-all corner of the coreroom. When I asked, "Why, in the name of Heaven?" my friend cut me short with the answer, "Mind your own business." Just the same I wrote an article—one of the first in this series—about my find, with sort of whipsocket in the age of autos inference and without mentioning my friend's name.

In a great big foundry not long ago, I found the boys using the five-digited sand approximeter to keep the production line moving while the laboratory boys processed their hourly samplings from the system and filled in their forms.

Then it occurred to me that even as an amateur, I could no more walk by a sand heap or chute without grabbing a handful than a dog could pass a tree without taking a sniff. Checking with professionals, I find that this instinct on the part of foundrymen is not odd or peculiar, by any means. I was told that sand grabbing not only was not a freakish abnormality, but to the contrary a reliable sign of foundry sophistication—the earmark of craftsmanship. These professionals also confided in me, after checking for eavesdroppers that no matter how many laboratory tests had been run on a batch or who guaranteed its qualities or condition (either in writing or orally), they would not risk their reputations by sending it down the line without first grabbing a handful and giving it the old one, two, three.

Gathering courage from this bit of research, I catch myself showing off a mite on foundry visits here lately by brazenly grabbing a handful of sand right in front of my host, looking toward the ceiling, one eyebrow up and the other down, and with a couple of uh-huhs saying, "A little on the wet side, 4.2 let's say?" Surprising myself, I've come pretty darned closed on several occasions.

Then, as I have mentioned any number of times in our man-to-man series, I have built a Goldberg moisture tester with radiant heat drier, automatic heat shutoff and direct calibrations in per cent of moisture on the balance. This development, of course, involved hundreds of tests in comparison with a sensitive chemical balance. But now that I think of it, throughout the entire project I wasn't entirely happy until my indicated results checked fairly close with the feel of things or until I knew why they hadn't. And now I find that I have done exactly the same thing throughout the development of my new micrometer sand strength and toughness tester.

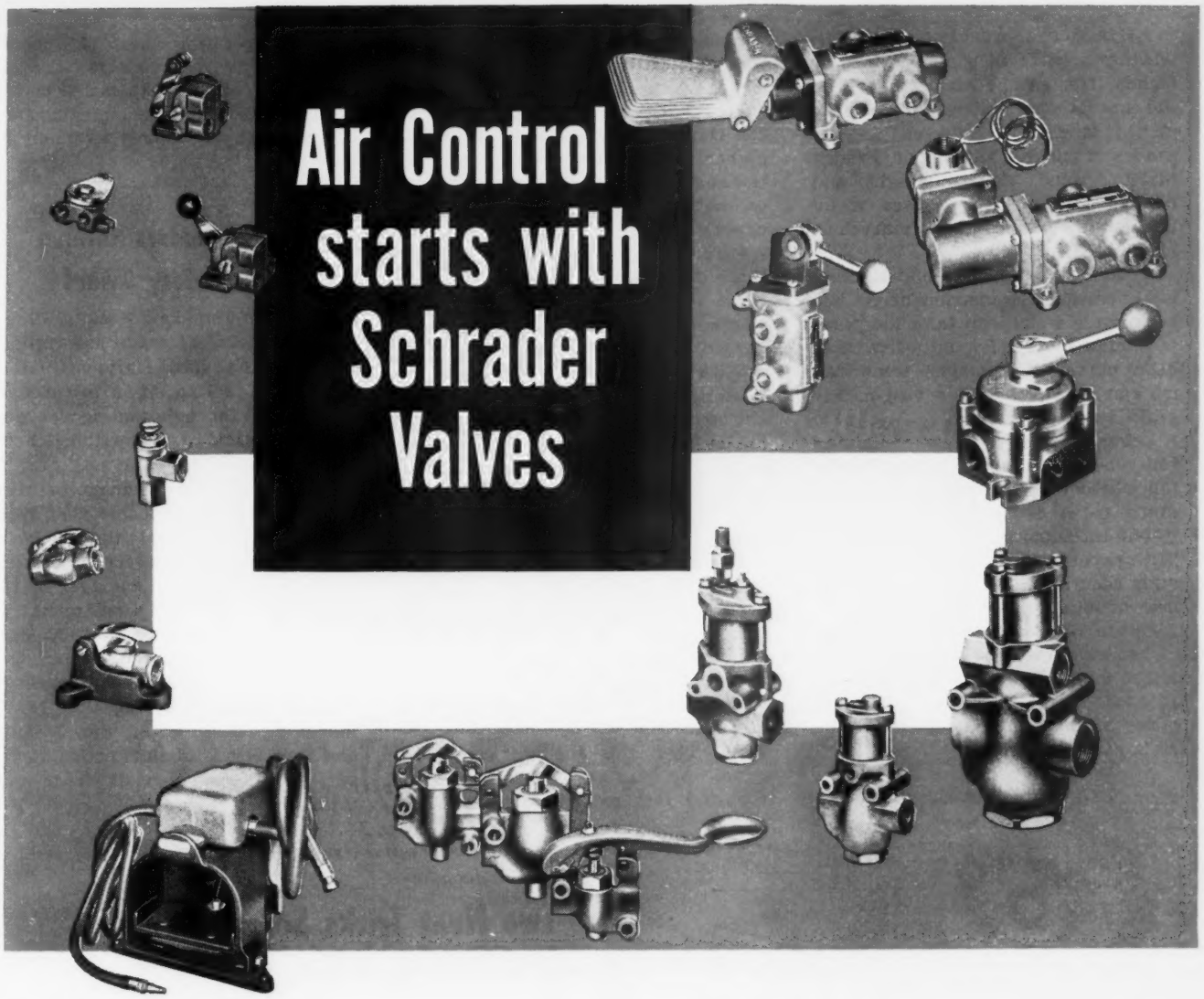
So, facing the fact that the feel test persists in spite of our splendid progress in testing procedures, equipment and standards, I began to realize what a wonderfully sensitive and handy device this human, five-digited sand approximeter really is. I began wondering, "How the Sam Hill can the hand feel these tiny little differences?" Consider moisture, for instance. How do the fingers go about telling the difference between dry sand and wet?

I called up the family doctor. After apologizing because Mother and I are so disgustingly healthy, I asked him to brief me on the little nerve ends which poke up through the hide on our fingers and hand. He came through with a batch of medical terms (all Greek to me) which had to be translated before I could grasp them.

Two kinds of nerve endings are distributed over the skin of the hand and fingers, with concentrations at the tips of the fingers. One kind specializes in the sense of touch and the other in temperature. In the joints is another brand, which has made a career of sensing motion and position.

Now, back to moisture estimating by touch or feel. (By the way, I reasoned this out all by my little self with a bit of cockiness upon learning I came close to the truth.) The fingers at 98.6°F contact the sand, the heat from them evaporates the moisture in the sand, the evaporating moisture refrigerates the fingers and the heat-sensing nerve ends estimate the temperature drop. And there you are. Some day, by heck, I'm going to whip up a moisture tester on this principle. We've got to get something as handy as the hand.

One of the things a fellow is apt to do when walking up to an unknown pile of sand is to rub a pinch of it between his fingers to see, or feel, rather, how fine or how coarse it



Controlled compressed air has given Industry muscle-saving power to produce more . . . economically . . . without fatigue . . . more safely.

Compressed air has become a must in every plant. If you are not now using it, investigate it. And—wherever you actually use compressed air—you'll make its use more effective if you use the best valves possible—Schrader Valves. They are designed and built by a company whose success dates back to 1844—more than a century of experience in air control.

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Find out how Schrader Valves can put compressed air to work to save you money. For specification data, write—or, if you prefer, fill out the coupon below.

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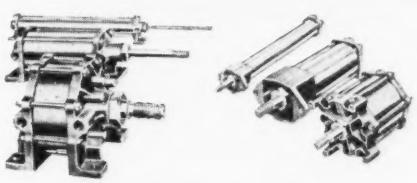
LEADERS IN AIR CONTROL SINCE 1844



The complete Schrader line of pneumatic accessories includes everything you need

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465 Vanderbilt Avenue, Brooklyn 38, N. Y., Dept. I-12

I am interested in more information on_____

Name_____ Title_____

Company_____

Address_____

is. Blindfolded, we can tell by feel whether a piece of glass is clear or etched (frosted). I wonder how deep the microscopic valleys are in the etched surface? Between fingers, grades of parting, silica flour, French molding sand, double nought and nought all give themselves away through the aid of those marvelous little nerve ends.

In some ultra-precise manufacturing operations, no instrument yet has been made which can take the place of human touch. By imitating these little nerve ends, maybe some day we can come up with a vest-pocket grain size micrometer.

Being one of the few remaining roll-yer-own cigarette smokers I can tell whether I've got hold of one cigarette paper or two. Each is exactly one-thousandths of an inch thick. With experience you can make amazingly accurate estimates of the thickness of different materials. How?

Here's one for the book—it's hard to believe. Those nerve ends in the finger joints which sense motion and position estimate how far a cigarette paper holds the fingertips apart. Boy oh boy!

Are those fines clay or silt? Wait a minute; let me get the feel of it. Either could be wet according to the temperature nerve ends, but with silt between the fingertips, they are parted with no resistance, whereas the clay glue tends to hold them together. The little dynamometer in the muscles which operate the fingers estimates the tiny differences in the effort required to part them. While there's no dial or pointer to indicate that difference in figures, there's some sort of an equivalent somewhere in our innards that gives a darned close approximation.

With all three sets of nerve ends working together in combinations of various degrees, with records kept in both our conscious and unconscious minds and evaluated either consciously or unconsciously, the human hand is a mighty and wonderous device.

I promised there would be no moralizing, but I've got to say this, even in the face of science's onward march. We don't need to go out behind a pile of abandoned flasks to feel a handful of sand. It would be an insult to the designer and manufacturer of this marvelous device. Then this thought comes to mind. As long as the hand squeeze, roll and feel sand test persists as the last operating court of appeals, there's plenty of room for the development of down-to-earth pocket instruments for measuring sand, sand mikes which are almost as handy as the hand.

Malleable Founders Receive Association Safety Award

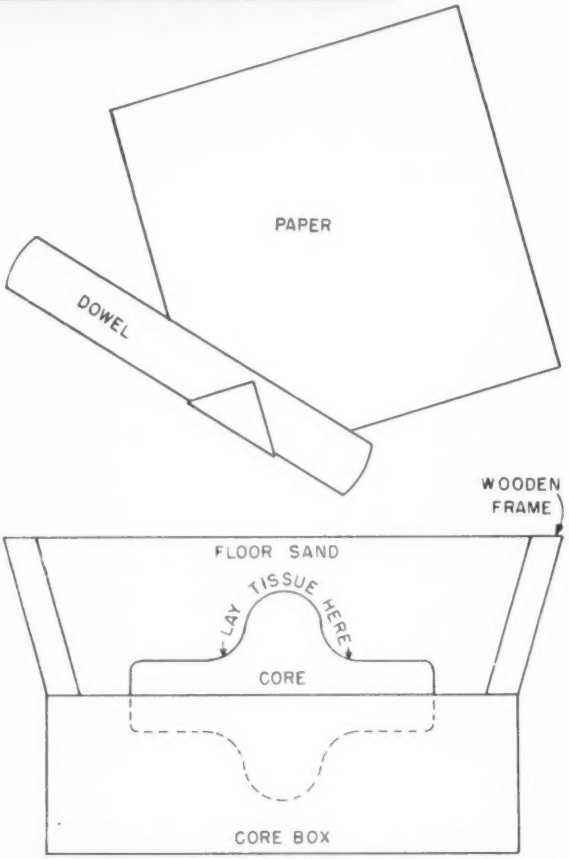
Malleable Founders' Society, Cleveland, is one of 11 trade associations cited at the 43rd National Safety Congress and Exposition in Chicago, Oct. 17-21, for outstanding work in the prevention of occupational accidents during 1954.

Carl L. Liebau, president of MFS and of Federal Malleable Co., West Allis, Wis., accepted the National Safety Council's Association Award from David L. Arm, manager of the council's industrial department, at a meeting on Oct. 19. W. J. MacNeill, Badger Malleable & Mfg. Co., Milwaukee, chairman of the society's safety subcommittee; Lowell D. Ryan, managing director of the society; and Fred Head, administrative assistant, also were present at the presentation ceremony.

HOW TO DO IT

Two Neat Tricks Solve Little Problems in a Busy Coreroom

By S. J. PITRE JR.
New Orleans



ROUND stock cores can be made easily without a corebox or a sweep as follows: Roll ordinary wrapping paper around a length of dowel rod of the desired diameter. Glue outside edge of the paper and slip out the dowel. Then ram core sand into the tube and bake the package in an oven. After baking, the paper may be removed easily and the core is ready for use.

Here's another idea that prevents bedding sand from sticking to cores. The bedding method is used when a drier is not available for baking a core. Cover the rammed core with unglazed tissue paper. Then place a wooden frame on the corebox around the core and dump bedding sand over the paper and ram. Roll the assembly over, draw the corebox off and bake the core in its bed of sand. When the bedding sand is removed after the bake the core is left clean and ready for blacking without cleaning.

Do you have any trick of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

behind
today's newest
automobiles

DEMMLER

The Oldest Name in Core Blowers

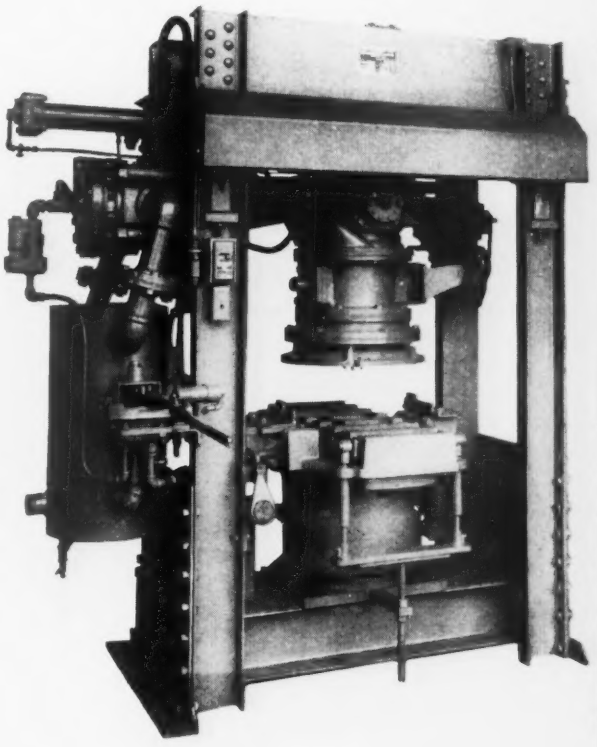
the DEMMLER 103

Since the days of the "horseless carriage" the name DEMMLER has meant the ultimate in fine core blowing machinery. Today — more than 45 years later — the modern Demmler 103 is meeting casting production demands of the nation's leading automobile manufacturers.

The Demmler 103 core blower is a stationary magazine type machine capable of blowing ANY core or molding sand into cores weighing up to 50 lbs. It is hard-blowing and extremely efficient. All air-operated, the 103 is carefully designed to minimize maintenance.

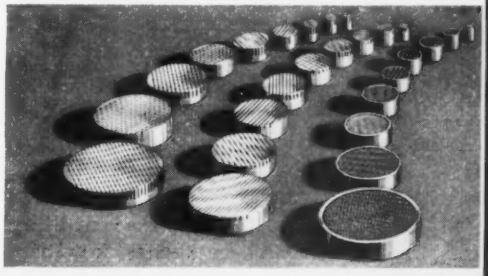
It's fast, too. The cycle of operation is 6 seconds maximum and it has produced as many as 2,000 cores per hour on a foundry production line.

The Demmler 103 can be equipped for fully automatic, semi-automatic or manual operation.



QUALITY - Built-into Every Core Box Vent

It's sound judgement to choose core box vents from a company which pioneered the manufacture of core blowers. Demmler engineers are constantly improving vent designs and developing new types. The HL 150 mesh vent, for example, is a special design for various applications including D-process shell molding. Brass-slotted, steel-slotted and screen types are available in sizes to meet every application.



WM. DEMMLER & BROS. - KEWANEE, ILLINOIS

Members of a panel discussion group include, left to right: A. M. Slichter, Pelton Steel Casting Co.; H. D. Phillips, Adirondack Foundries & Steel Inc.; W. H. Muchnic, the Locomotive Finished Material Co., and W. H. Worrilow Jr., Lebanon Steel Foundry

Marketing Is Major Subject at

STEEL FOUNDERS' FALL MEETING

By WILLIAM G. GUDE
Managing Editor

WITH its program tied to the theme—planning for a healthy steel foundry future—the Steel Founders' Society of America devoted the major part of its 53rd fall meeting to the subject of marketing. Held Oct. 24-25 at the Greenbrier, White Sulphur Springs, W. Va., the meeting was attended by more than 160 steel foundrymen.

A. J. McDonald, society president and vice president, American Steel Foundries, Washington, presided at the opening session and discussed briefly some of the recent activities of the SFSA committees. He reported progress on all of the projects recommended a year ago by the Program Appraisal Committee.

Preparation of material for one of a series of study courses being sponsored by the American Society for Metals has been completed. Other technical work reported on included completion of a research report on shell molding of steel castings and co-operative work with the American Standards Association on magnetic particle testing of pressure castings for the petroleum industry.

Referring to business conditions, Mr. McDonald said that July bookings of steel castings reached the highest level in four years and production was at 70 to 75 per cent of maximum commercial demand. Mr. McDonald also announced that Clarence Tolan Jr., retired president of Dodge Steel Co., Philadelphia, had been elected an honorary life member of the society.

Future markets for steel castings will be what foundrymen make them, declared F. Kermit Donaldson, executive vice president of SFSA. The important factor in market development is knowledge—not only of the products themselves but also of the customers' problems. Product information, he said, must be based on continuing research; consumers' needs require further study because the buyer is concerned primarily with the service he receives from a casting, not with how it is made.

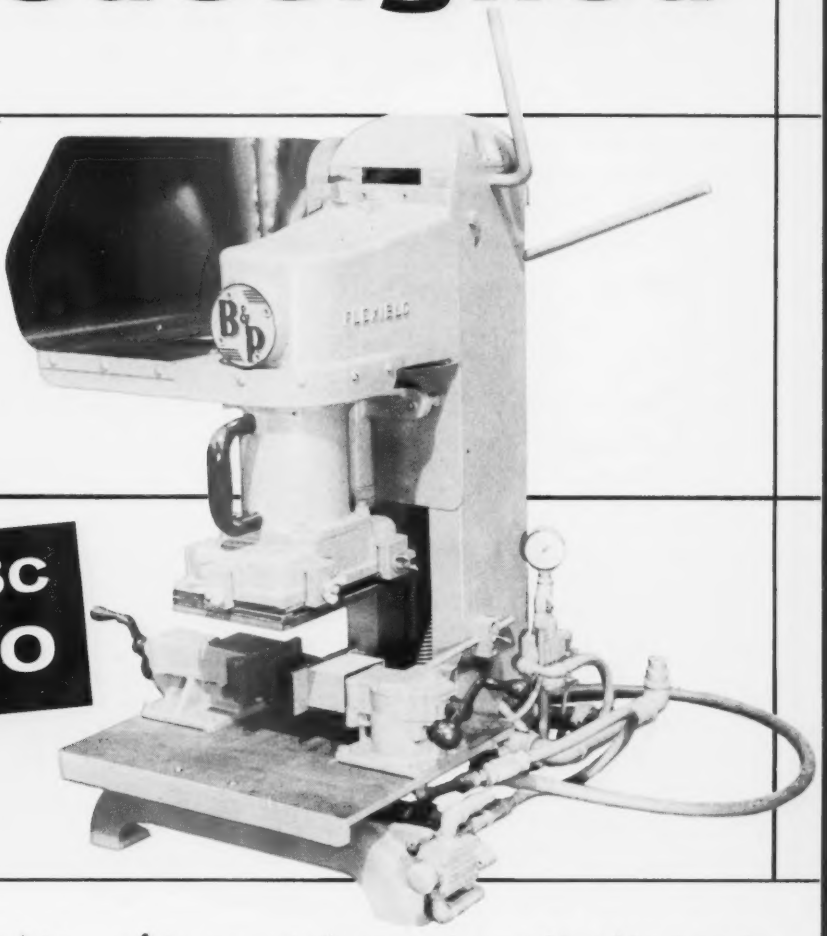
Mr. Donaldson urged the adoption of a positive approach in sales pro-

A. J. McDonald, left, society president, and E. M. Layman, Safety Committee chairman, don hard hats in presenting awards for the annual safety contest. H. F. Park Jr. accepts award for General Steel Castings Corp., Eddystone, Pa.

THE MOST WIDELY USED COREBLOWER IN THE WORLD HAS BEEN

completely redesigned

the new CB5C FLEXIBLO



Here's welcome news for foundry operators interested in cutting costs — (and who isn't these days?). The CB5 — for years the most widely used machine in the small coreblower field — has been completely redesigned. The new CB5C brings you important *cost cutting* features never before available in a small blower.

- ✓ Handles all types of boxes and all types of jobs. (The CB5CD even incorporates a full two inch draw cylinder.)
- ✓ Operation is completely automatic and actuated by push button.
- ✓ Clamping, blowing, unclamping etc. are automatically sequenced — top speed with no chance of error.
- ✓ New design blow valve assures perfect cores — cycle after cycle.
- ✓ An automatically-operated removable table clamp for handling vertically-split boxes.
- ✓ Quick-change blow plate and quick height adjustment.

These are but a few of the new features — write now for complete information — Beardsley & Piper, Division Pettibone Mulliken Corporation, 2424 North Cicero Avenue, Chicago 39, Illinois.

LOOK TO
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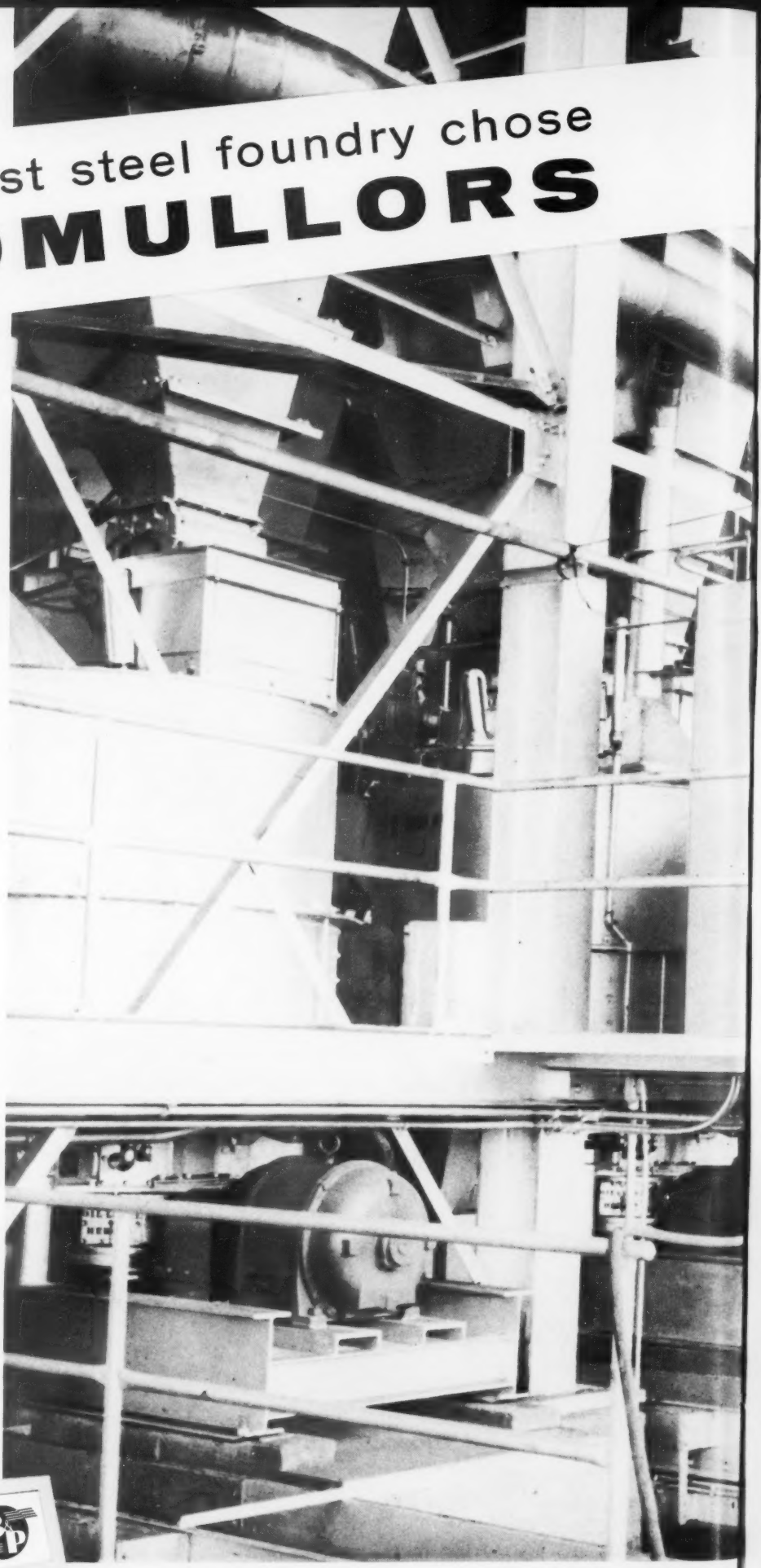
FOR BETTER METHODS

MEMBER FEMA

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

Canada's largest steel foundry chose SPEEDMULLORS



The giant Steel Foundry Division of Canadian Car and Foundry Company is really five large foundries in one. All of these foundries are dependent on a single sand system which might well be considered the *lifeline* of the entire plant.

At the center of this lifeline are four new Model "80 A" Speedmullors which supply all of the molding sand to all five of the component foundries. Here, where dependability is absolutely essential, Canadian Car has followed the ever growing trend and chosen Speedmullors.

MULLTROLMATIC controls are provided for each of the four mullors. A full 24 cubic foot batch of mulled and cooled sand is discharged from each mullor every 70 seconds. The sand is thoroughly mulled so fast that in effect a continuous supply of mulled sand is available. That's important at Canadian Car where four big Sandslingers and Speedslingers are kept busy full time.

Write for your free copy of the Canadian Car story and ask for the new bulletin on the Series A Speedmullors.

Beardsley & Piper Division Pettibone Mulliken Corporation, 2424 North Cicero Ave., Chicago 39, Illinois.

LOOK TO
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FOR BETTER METHODS

MEMBER FEMA

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

motion. For instance, nondestructive testing methods should be termed a means of assuring the customer of the soundness of a casting, not as a way of disclosing defects. He also pointed to the necessity of improving production practices to meet the increasing emphasis of buyers on higher quality and the growing volume of purchases based on definite specifications.

Factors that influence business success were discussed by R. A. Foulke, vice president, Dun & Bradstreet Inc., New York. A major cause of business failures, he said, is too high an inventory in relation to working capital. Other unsound policies are: Too many poor credit risks; excessive investment in fixed assets; top-heavy fixed debt or current liabilities; excessive salaries or dividends; excessive loans to subsidiaries or officers.

Mr. Foulke presented figures for ten branches of the metalworking industry which showed various financial ratios. Average data for approximately 100 foundries in the five years 1950-1954 indicated, among other things: 1. Current asset to current liability ratio of 2.73; net profit on net sales of 3.74 per cent; net profit on tangible net worth of 10.2 per cent; net sales to tangible net worth of 2.75 per cent; ratio of inventory to net working capital of 62.1 per cent (lowest of the ten types of business studied).

A panel discussion of the society's market research and development program had as speakers the chairmen of four committees which are concerned with this subject.

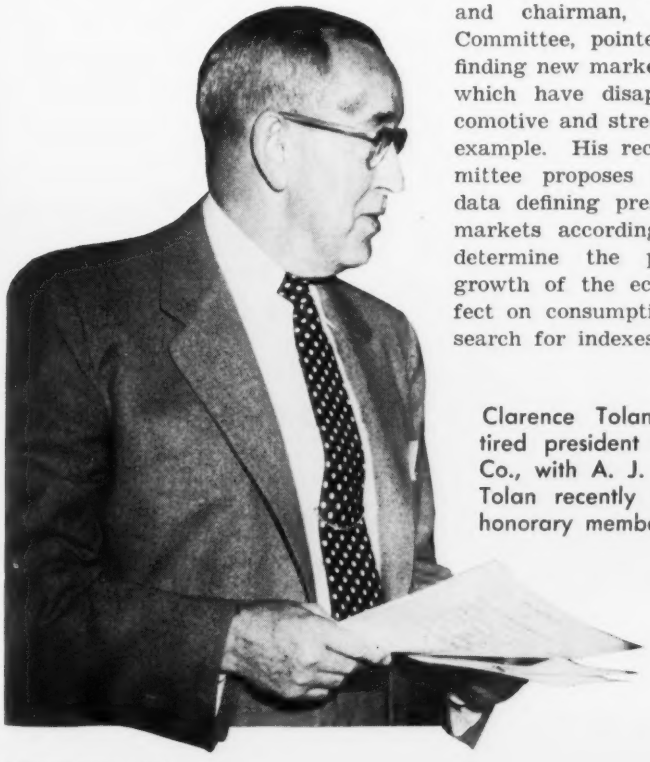
F. Kermit Donaldson, executive vice president, addressing the 53rd fall meeting of the SFSA

A. M. Slichter, president of Pelton Steel Casting Co., Milwaukee, and chairman, Market Research Committee, pointed to the need for finding new markets to replace those which have disappeared—steam locomotive and street car castings, for example. His recently formed committee proposes to 1) accumulate data defining present steel castings markets according to end uses, 2) determine the probable future growth of the economy and its effect on consumption of castings, 3) search for indexes which may be of use in forecasting demand for castings and 4) ascertain how castings production capacity compares with present and future demand.

Benefits derived from the SFSA research activities were outlined by H. D. Phillips, vice president, Adirondack Foundries & Steel Inc., Watervliet, N. Y., and chairman, Technical Research Committee. Results obtained from the more than thirty individual projects, conducted at a cost of nearly one-half million dollars, have enabled steel foundries to improve their marketing position by offering a higher quality product. At the same time Mr. Phillips pointed out that research expenditures actually are relatively small—only 0.014 per cent of sales. One important study now being made seeks the cause and elimination of burn-on in order to improve surface finish and machinability.

Speaking for the Product and Market Development Committee, of which he is chairman, W. H. Muchnic, president, Locomotive Finished Material Co., Atchison, Kans., announced some details concerning the society's third conversion and redesign contest. The contest will close June 1, 1957. The committee also plans publication of a quarterly market development letter incorporating facts for foundry salesmen.

Activities of the Advertising, Public Relations and Education Committee were outlined by its chairman, W. H. Worrilow Jr., vice president, Lebanon Steel Foundry, Lebanon, Pa. These include advertising, publicity in the form of news items, technical



Clarence Tolan Jr., right, retired president of Dodge Steel Co., with A. J. McDonald. Mr. Tolan recently was elected an honorary member of the society

articles and lectures, and educational work in schools.

Winners of the society's annual safety awards were announced at a luncheon concluding the meeting by E. M. Layman, director of personnel, General Steel Castings Corp., Granite City, Ill., and chairman, SFSA Safety Committee.

This ninth annual safety contest, held during June, July and August, had 141 entries and 51 winners. Last year there were 151 participants and 66 winners. Records were judged in four groups set up on the basis of number of man-hours worked. Highest honor awards went to plants in each group having no lost-time accidents, a total of 24 foundries. Twenty-seven foundries with frequency rates of 10 or less received certificates. Average frequency of all plants was 19.9. This compares with 15.8 in 1954 but was the fourth lowest of the last nine years. Contest winners follow:

HIGHEST HONOR AWARDS

(Group No. 1, 1-20,000 Man-hours Exposure)

Deemer Steel Casting Co., New Castle, Del.; Eastern Malleable Iron Co., Wilmington, Del.; Tonawanda Electric Steel Casting Corp., North Tonawanda, N. Y.; Caldwell Foundry & Machine Co. Inc., Birmingham; Arneson Foundry Inc., Kenosha, Wis.; Allegheny Ludlum Steel Corp., Forging & Casting Division, Ferndale, Michigan; Stainless Foundry & Engineering Inc., Milwaukee; Pacific Steel Casting Co., Berkeley, California; U. S. Foundries Inc., Denver; Utility Steel Foundry, Vernon, Calif.; Washington Iron Works, Seattle, Wash.

(Group No. 2, 21-35,000 Man-hours Exposure)

Chapman Valve Mfg. Co., Indian Orchard, Mass.; Shawinigan Chemicals Ltd., Stainless Steel & Alloys Division, Shawinigan Falls, Quebec; Atlas Steel Casting Co., Buffalo; Dibert, Bancroft & Ross Co. Ltd., New Orleans; National Roll & Foundry Co., Avonmore, Pa.; Alloy Cast Steel Co., Marion, O.; Alloy Steel & Metals Co., Los Angeles; National Supply Co., Torrance, Calif.

(Group No. 3, 36-70,000 Man-hours Exposure)

Pelton Steel Casting Co., Milwaukee; Ross-Meehan Foundries, Chattanooga, Tenn.

(Group No. 4, 71,000 and Up Man-hours Exposure)

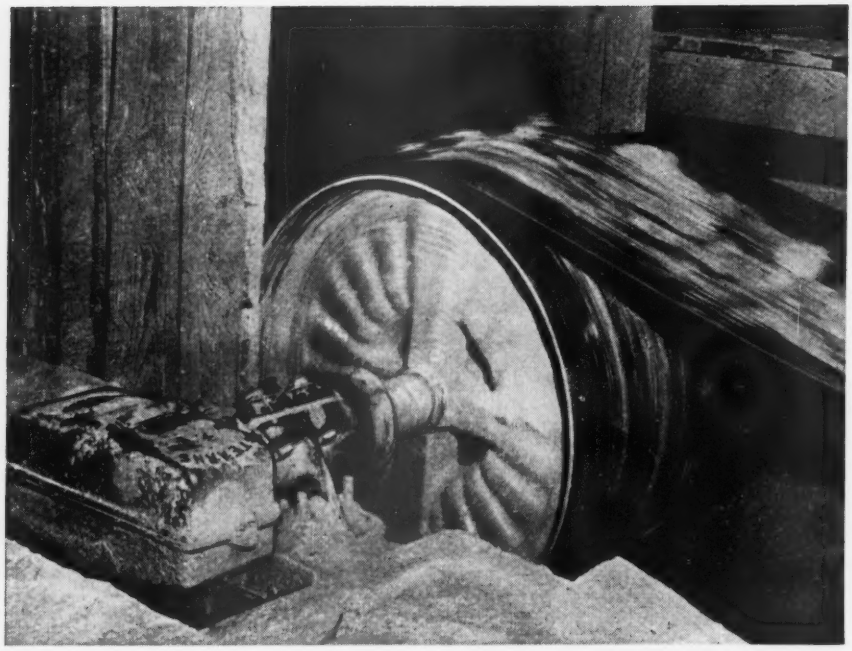
General Steel Castings Corp., Eddystone, Pa.; Oklahoma Steel Castings Co., Division of American Steel and Pump Corp., Tulsa, Okla.; American Steel Foundries, Alliance, O.

CERTIFICATE AWARDS

(Frequencies as indicated)

Continental Foundry & Machine Co., Coraopolis, Pa. (2.3); National Malleable & Steel Castings Co., Cicero, Ill. (3.0); National Malleable & Steel Castings Co., Sharon, Pa. (3.5); Continental Foundry & Machine Co., East Chicago, Ind. (3.6); United States Steel Corporation, Johnstown, Pa. (4.0); Dominion Foundries & Steel Ltd., Hamilton, Ont., Canada (4.1); General Steel Castings Corp., Granite City, Ill. (4.4); United Engineering and Foundry Co., Vandergrift, Pa. (4.5); Sivyer Steel Casting Co., Milwaukee (4.9); Continental Foundry & Machine Co., Wheeling Works, Wheeling, W. Va. (5.1); Penn Steel Castings Co., Chester, Pa. (6.2); Sawbrook Steel Castings Co., Lockland, Cincinnati (6.6); Kay-Brunner Steel Products Inc., Alhambra, Calif. (6.9)

Mackintosh-Hemphill Co., Midland, Pa. (6.9); Michigan-Standard Alloy Casting Co., Detroit (7.2); Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. (7.6); Wehr Steel Co., Milwaukee (8.1); West Steel Casting Co., Cleveland (8.1); Taylor-Wharton Iron & Steel Co., High Bridge, N. J. (8.3); Symington-Gould Corp., Depew, New York (8.6); American Hoist & Derrick Co., St. Paul (8.8); Ohio Steel Foundry Co., Lima, O. (9.2); Crucible Steel Co. of America, Harrison, N. J. (9.2); Duriron Company Inc., Dayton, O. (9.7); Dodge Steel Co., Philadelphia (9.7); Lebanon Steel Foundry, Lebanon, Pa. (9.9); American Steel Foundries, Granite City, Ill. (10.0).



New magnetic pulley stops tramp iron riding the load peaks

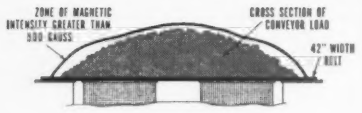


Diagram showing magnetic field for 2-coil, 36-in.-dia., 42-in.-wide pulley. Note how magnetic field blankets entire load.

This new Stearns 2-coil electromagnetic pulley effectively removes tramp iron riding the crest of a conveyor load as well as the pieces that pass close to the magnet's face. Two-coil design produces a powerful magnetic field that is deepest at the center of the conveyor belt where load is heaviest. Thus, the area of magnetic attraction is the same general shape as the load on a conveyor operating under standard conveyor practices.

Smaller, lower-cost pulleys now practical

Because of the nature of the magnetic field, smaller pulleys costing less can now be used on jobs where larger units were formerly needed. An examination of data on a number of proposed installations showed that, in the majority of cases, the recommended new 2-coil pulley was of smaller diameter than a 3-coil pulley of comparable ability.

New, simple pulley selection method*

Because this pulley fits right into recommended conveyor standards for speed of belt travel and depth of load for various types of materials, it is far simpler to select the right pulley than ever before. Stearns provides new selection tables in Bulletin 303-C that now make it possible for you to select the right size unit for your job even before you consult our sales engineers.

Get all the facts on this new magnetic pulley. Find out how it simplifies pulley selection. Write for Bulletin 303-C.

*Copyright 1954, Stearns Magnetic, Inc.

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MAGNETIC EQUIPMENT FOR ALL INDUSTRY

STEARNS MAGNETS

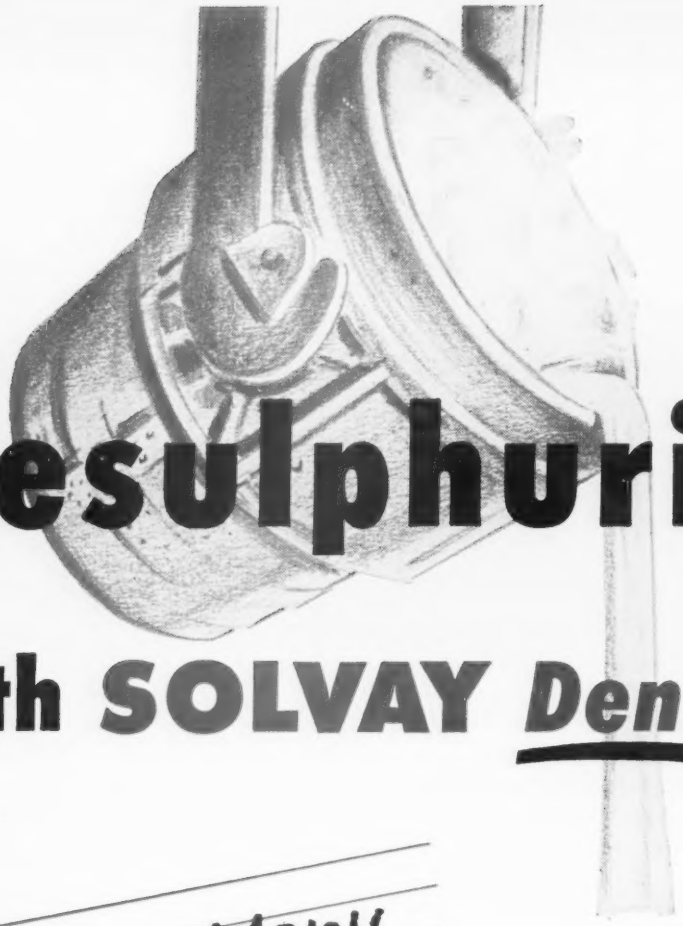
STEARNS MAGNETIC, INC., 662 S. 28th St., Milwaukee 46, Wisconsin

Season's Greetings

Twelve long months of the year we concentrate on turning out products of the very highest quality for your use. That's sort of a reward in itself to folks who love the business the way we do. But each Christmas when we take stock of the year, our growing list of friends in the industry heads all assets on the balance sheet. So from all of us at Cedar Heights to all of you in the industry . . .

Best wishes for a Happy Holiday Season!

CEDAR HEIGHTS CLAY 50 PORTSMOUTH ROAD OAK HILL, OHIO **COMPANY**



Desulphurization

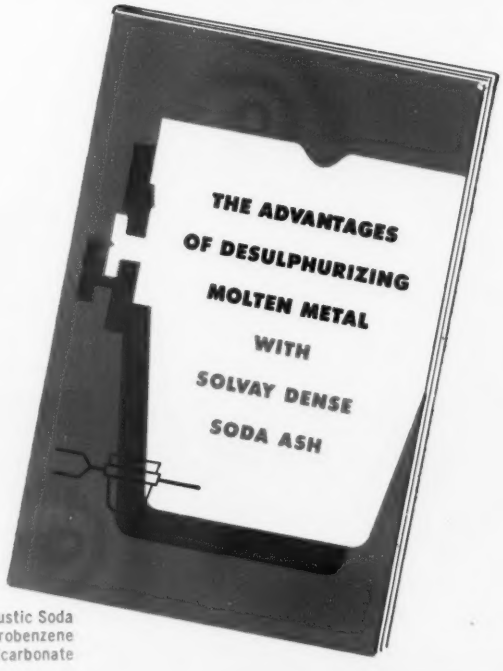
with SOLVAY *Dense* Soda Ash

SOLVAY DENSE SODA ASH has gained wide acceptance for efficient desulphurization. This 100% active material helps produce better, more fluid metal . . . and gives you these other advantages: it's free-flowing; the small grains melt very rapidly, allowing faster, more uniform dispersion; and it's easily added by means of simple equipment. The use of Solvay Dense Soda Ash is a flexible one—you use only as much as you need. And remember, Solvay Dense Soda Ash is the LOW COST form of desulphurization!

Further Information Contained in Valuable Book—Available on Request*

"The Advantages of Desulphurizing Molten Metal with Solvay Dense Soda Ash" has been published by Solvay for the benefit of the foundryman. It contains important information on the advantages you can gain by desulphurizing with Solvay Dense Soda Ash. It also explains what type of equipment is needed and how to obtain it. This book is available without cost or obligation*. Write for your copy today!

*In Western Hemisphere Countries.



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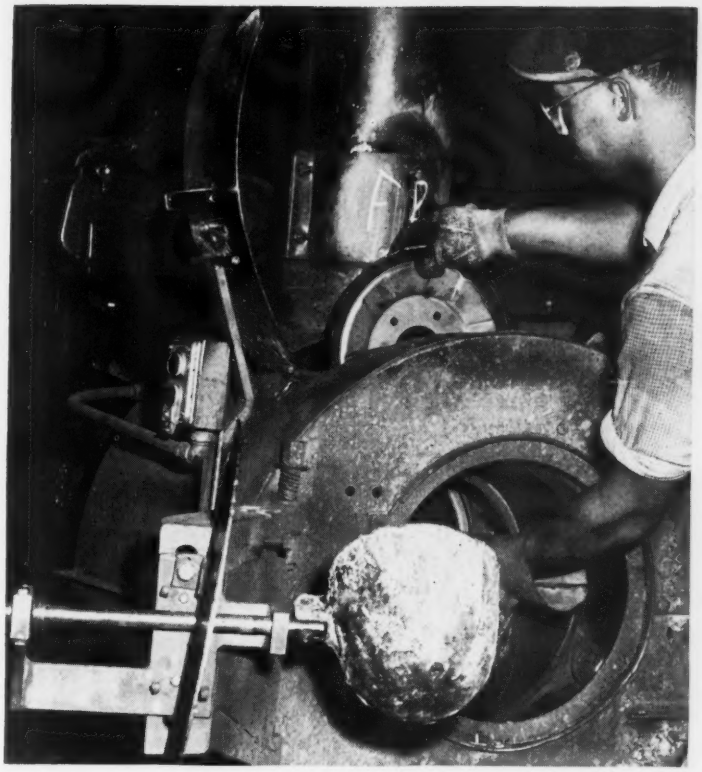
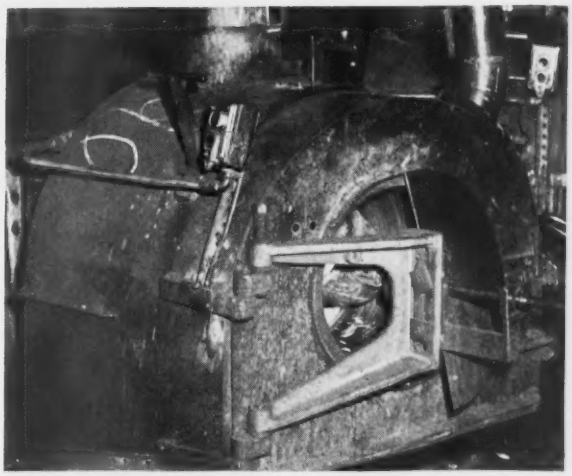
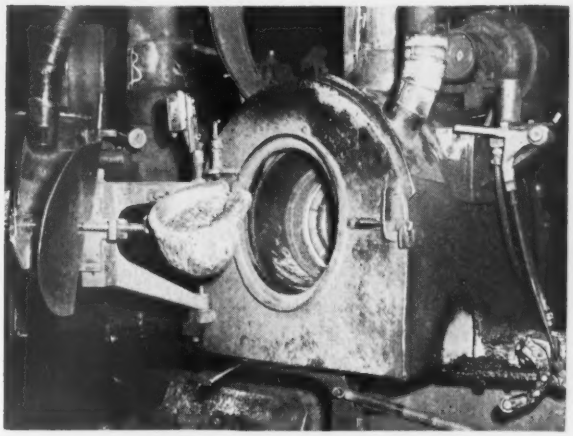
Chloroform • Methylene Chloride • Methyl Chloride • Carbon Tetrachloride • Sodium Bicarbonate



Stamped steel disk, forming the drum backplate, is put into centrifugal casting machine through a top opening



A measured amount of iron is poured into the spinning mold from a ladle in a swinging door



An air cylinder opens each mold and ejects the drum to a floor skid under the machine

Casting Brake Drums

. . . 15 a Minute

By ROBERT H. HERRMANN
Associate Editor

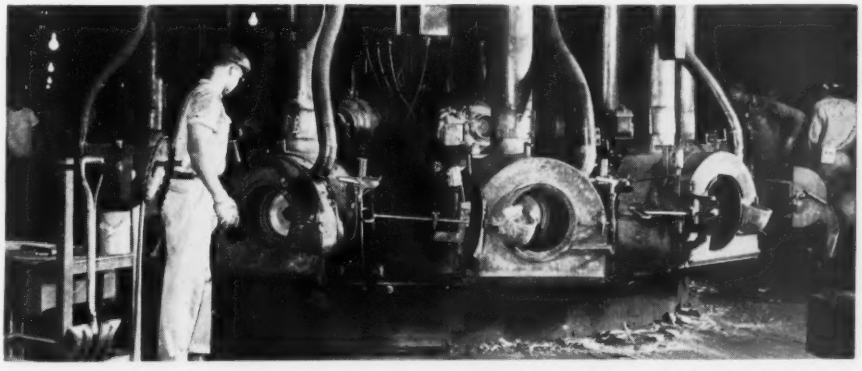
BUICK Motor Division, General Motors Corp., Flint, Mich., is centrifugally casting one gray iron brake drum every four seconds. Drums are produced in 60 centrifugal casting machines mounted ten each on six turntables which revolve 15 times per hour. Each machine makes one drum every 4 minutes.

A stamped steel disk forms the backplate of the drum. Inverted wedge-shaped teeth around the edge of the disk are cast-in to the drum and form a mechanical lock with the gray iron. Disks are delivered to the molding section on hooks suspended from an overhead monorail conveyor. They are cleaned in a degreasing solution and stacked on tables at each of the turntables.

An operator opens a hinged door at top of a casting machine and inserts the disk in the mold. Then he closes the door and presses a button to actuate an air cylinder which closes the mold and starts the machine spinning at 450 rpm. The table continues to revolve to the pouring station.

Each machine of the turntable is supplied with cooling air through a pipe mounted near the front of the machine. A larger pipe near the back of the machine exhausts smoke and fumes. The individual pipes are connected to larger, centrally located pipes above the turntables.

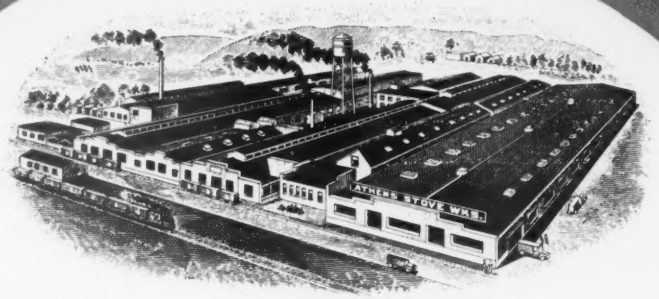
Iron from the cupola is delivered in a bull ladle and poured into a small measuring ladle pivot-mounted in a rig adjacent to each table. From there it is transferred to a shank ladle and then into a pivoted ladle in the swinging door of each machine. The ladle enters the casting



Ten centrifugal machines are mounted on each turntable. Individual pipes to every casting machine supply cooling air and exhaust smoke and fumes

SAN-BLO

F. O. MAHERY
VICE PRES.-GEN. MGR.



THE ATHENS STOVE WORKS, INC.

MANUFACTURERS OF STOVES

ATHENS, TENNESSEE

May 24, 1955

Mr. George E. Miller, Sales Mgr.
San-Blo Division
Federal Foundry Supply Co.
Cleveland 5, Ohio

ALL CONTRACTS CONTINGENT UPON STRIKES, ACCIDENTS AND CAUSES BEYOND OUR CONTROL. PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

Dear Mr. Miller:

We thought you would be interested in learning how our San-Blo core blower is working out for us.

As you know, burner cores have always been a big problem for the stove industry, because of their thin sections, intricate contours and the required high strength. Consequently, it has always been difficult to adapt burner cores to a core blowing machine.

We previously tried other makes of core blowers, but without much success. We found that when we used sand heavy enough to make cores of sufficient strength, it would not blow consistently through the machine. If we used sand that would flow through the machine, the baked cores were too weak and would collapse.

We are pleased to advise that, with our model 40-D-1 San-Blo, we are now able to successfully blow all our burner cores, using a sand of sufficient strength to give us excellent cores and high quality castings. We might add that, on occasions, we have been able to eliminate the use of reinforcing wires, because of the uniform ram we obtain on the San-Blo.

Yours very respectfully,

THE ATHENS STOVE WORKS, INC.

F. O. Mahery Jr.

Sec. & Treas.

does the job again!

ATHENS STOVE WORKS *reports...*

"..with our model 40-D-1 San-Blo, we are now able to successfully blow all our burner cores...."

SAN-BLO succeeds where other core blowers fail because it uses an entirely new and different core blowing principle. The *exclusive* SAN-BLO sand chamber design utilizes motor-driven plows and "cyclo-air" action to *flow and ram* the sand, instead of *squirting* it into the core box. This enables the SAN-BLO to blow all practical core or molding sand mixtures with equal efficiency.

This ability to do the job—to blow any core sand mixture—is what particularly distinguishes the SAN-BLO from all other core blowers. The SAN-BLO can do the job for you, too! Call in your SAN-BLO sales-engineer, or write us for information.

In addition to "cyclo-air" action, the SAN-BLO provides the following important, exclusive features as *standard equipment* on its various models:

- **UNIVERSAL SAND CHAMBER**—Cores weighing from a few ounces to full capacity of machine are blown with the same sand chamber, at maximum blowing efficiency.
- **ADJUSTABLE SAND CHAMBER**—Sand chamber is easily raised or lowered to accommodate various height core boxes—eliminating "stooling" or expensive machine modifications.
- **QUICK-CHANGE BLOW PLATE**—For closed core boxes, the blow plate may be changed by simply removing the clevis pin and clamp ring—no tools required!
- **SINGLE PUSH BUTTON CONTROL**—All SAN-BLO models have single push button control for automatic clamping, blowing and drawing operations.
- **AUTOMATIC DRAW**—Self-adjusting, oil-controlled, with automatic change from slow to fast, for maximum speed and accuracy.

SAN-BLO *"cyclo-air" sand chamber, with motor-driven plows.*

Vent rods being inserted in Athens burner core box. Their SAN-BLO (right) is equipped with a clamping table "delay" unit, to permit withdrawing the rods before drawing the core.

FEDERAL

MEMBER FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. FEMA

San-Blo Division

The **FEDERAL FOUNDRY SUPPLY** *Company*

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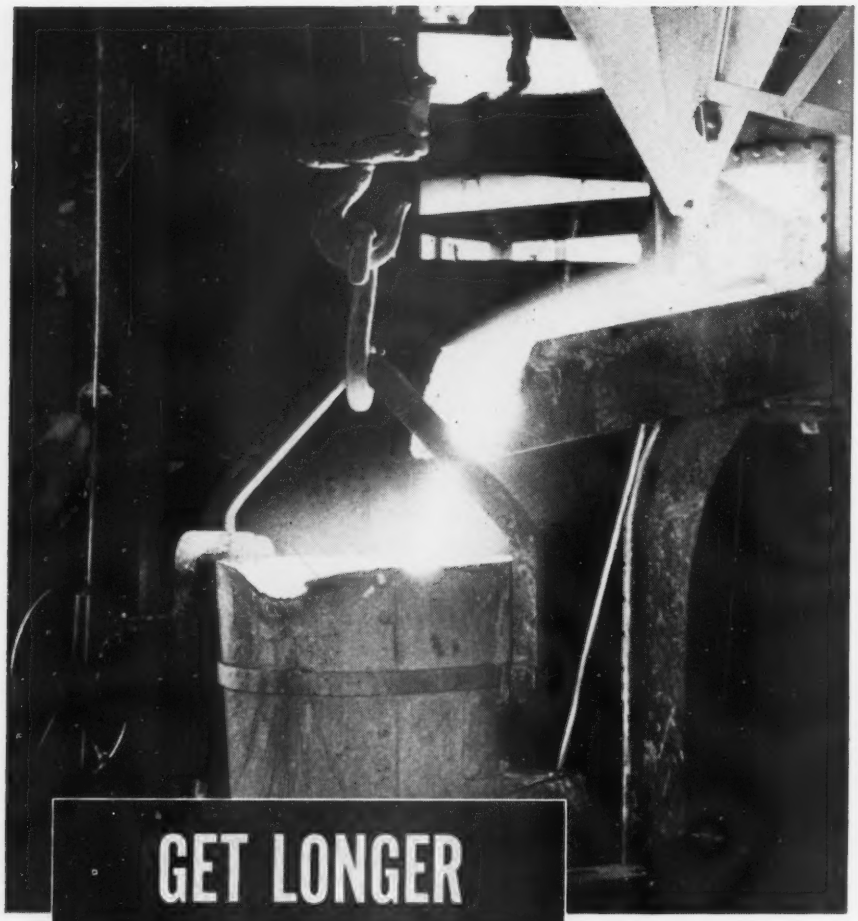

GET LONGER REFRACTORY LIFE

Use this 5-point LACLEDE-CHRISTY MAINTENANCE PLAN

These suggestions help you lower costs by reducing furnace down time and increasing furnace life:

1. Make an on-the-job study of your problems. Let Laclede-Christy engineers consult with your engineers in your plant.
2. Analyze your problems with Laclede-Christy mechanical, combustion and refractory engineers. You receive the benefit of Laclede-Christy experience with similar problems.
3. Get recommendations covering refractory materials best suited to your needs. Get complete instructions on proper application.
4. Make periodic check-ups with your Laclede-Christy Service Engineer. He's available on short notice.
5. Use refractories available from stock in a nearby Laclede-Christy or distributor warehouse—or direct from a Laclede plant. Shipment in most cases two or three days within receipt of order. Call or see your Laclede-Christy representative soon.

LACLEDE-CHRISTY COMPANY

HKP A DIVISION OF H. K. PORTER COMPANY, INC.

DIVISION OF H. K. PORTER COMPANY, INC.

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LACLEDE-CHRISTY COMPANY FOUNDED 1844 Quality First

Inaugurating a new era of service to the industrial heating industry

machine as the door is closed, and the mold is poured.

As each machine revolves to the discharge station it trips a switch which stops spinning of the machine and actuates an air cylinder to open the mold and eject the cast drum. It falls out the bottom of the machine at the front to a metal chute on the floor and is hooked to carriers on a monorail conveyor for movement to cleaning and finishing operations.

Drums are made in three sizes. One contains 24.41 lb of iron and a 3.77-lb backplate for total weight of 28.18 lb. The second has 21.23 lb of iron and a 3.77-lb backplate for total weight of 25 lb. The third has a 3.79-lb backplate and 17.71 lb of iron for a total of 21.50 lb. These weights are as cast. Rough and finish boring reduces these weights considerably.

Soft iron rated at 25,000 lb tensile strength is used in the drums. It contains 3.30-3.60 TC, 2.50-2.75 Si, 0.60-0.70 Mn, 0.15 max P, 0.15 max S and 0.20 Mo. In addition, a graphitizing agent is added to reduce chill effect and maintain a pearlitic structure of the metal. Drums are poured at 2500-2550°F. The molds are made of the same metal except that the molybdenum and graphitizing agent are omitted.

National Safety Council Offers New Publications

Four new "safetygraphs" have been produced by the National Safety Council and now are available. No. 25 in the series is "Two-Wheel Hand Trucks," which covers materials handling throughout a plant. The other three, Nos. 26, 27 and 28, cover first aid.

No. 26, "How To Control Bleeding," shows latest techniques for stemming capillary, venous and arterial bleeding. No. 27, "First Aid Treatment for Burns," includes information on ordinary burns, frostbite, radiation and electrical burns and chemical burns to the eyes or skin. No. 28 is "Transportation of Injured Persons," which covers examination of conscious or unconscious persons to determine spine and neck injuries. With previously published No. 23, "Two Methods of Artificial Respiration," these numbers constitute a basic course in first aid.

For additional information on these numbers or on the entire Safetygraph series, write to Membership Department, National Safety Council, 425 North Michigan Ave., Chicago 11.

Develops New Method for Manganese Determination

Uses Same Solution as Combined Carbon Test

By John Kay*

An article entitled "Colorimetric Determination of Combined Carbon in Cast Iron," by Arch Jamieson, district metallurgist, Canada Iron Foundries Ltd., Hamilton, Ont., was presented in October FOUNDRY, p. 132. A logical development of the method appeared to be to use part of the solution for the determination of manganese as well.

Since almost all of our samples call for complete analysis and are run in batches of five or six, a combined method such as this offered possibilities of saving time and reagents. Results proved to be good and were confirmed by another laboratory.

The method, described below, fundamentally is the same as that used in a large number of laboratories where manganese is determined on a separate sample. Its advantages are savings in reagents and weighing-out time and a more distinct end point.

1. Silver Nitrate — Dissolve 12 grams silver nitrate in sufficient water and dilute to 1 liter. Store in opaque or painted bottle.

2. Sodium Arsenite—Dissolve 1.93 grams sodium arsenite in sufficient water and dilute to 2 liters. Standardize against a standard iron sample.

Method—Pipette off 25 ml from the solution prepared for combined carbon determination and transfer to a 250-ml wide-mouth Erlenmyer flask. This gives the equivalent of a 0.2-gram sample. Add 10 ml silver nitrate solution, dilute to 100 ml with distilled water and boil. Add 10 ml of a saturated solution of ammonium persulphate (freshly prepared) and boil for one minute. Cool rapidly in a water bath and titrate with standard sodium arsenite solution. Results of this procedure are shown in the following table:

Sample No.	Combined Method, % Mn	Regular Method, % Mn	Difference
4 H	0.78	0.84	−0.06
7 E	0.47	0.44	+0.03
82 A	0.66	0.65	+0.01
122 C	0.56	0.55	+0.01
1588	0.56	0.53	+0.03
1589	0.56	0.57	−0.01
1591	0.84	0.85	−0.01
4 H	0.83	0.84	−0.01
5 J	0.71	0.70	+0.01
7 E	0.46	0.45	+0.01
82 A	0.65	0.65	NIL
122 C	0.55	0.55	NIL
		Mean Difference	0.02

These samples include ingot molds, chilled iron wheels, gray iron, Ni-Cr iron, and Ni-Cr-Mo iron.

*Canada Iron Foundries Ltd., Hamilton, Ont.

STANDARD HAS ENGINEERED AND BUILT FOUNDRY CONVEYORS SINCE 1906

Standard Conveyor Company has an experience record of almost a half century — engineering and building foundry conveyors. On any foundry handling problem Standard can aid you to select and install conveyors that will give you reduced handling time — uninterrupted smooth flow in production — careful safe handling of light or heavy molds — better storage facilities — and help conserve and better utilize existing foundry space.

Available in a wide range of sizes, weights and types — equipped with shielded bearings expressly designed for severe foundry service — to suit a wide variety of foundry applications. Whatever your specific need, Standard is qualified by experience and facilities to recommend and furnish the right type of conveyors.

Send for Standard's special catalog "Conveyors for Foundries" F-125— a valuable reference book illustrating and describing conveyor installations in leading foundries.

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Standard

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ENGINEERED FOR LOW-COST PRODUCTION

Good Outlook Seen by

FOUNDRY EQUIPMENT BUILDERS

By WILLIAM G. GUDE
Managing Editor

DEMAND for foundry equipment has shown a sizable recovery this year from the 1954 dip, and the outlook for coming months remains favorable. This was indicated at the 37th annual meeting of the Foundry Equipment Manufacturers Association, held at the Greenbrier, White Sulphur Springs, W. Va., Oct. 13-15.

The first day was devoted to individual product group meetings. Association President William B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, presided at the annual business meeting. C. R. Heller, secretary-treasurer, reported on various activities of the association during the last year, including the successful spring meeting and work of the product groups.

In discussing FEMA statistical reports, Einar A. Borch, National Metal Abrasives Co., Cleveland, said that the 1955 business pace in general has exceeded most of the predictions made for it late last year. Job security and heavy demand for consumer goods have been important factors in the upturn. He said that the major selling job for equipment builders is to educate foundries as to the high cost of postponing replacement of old equipment.

William N. Davis, exhibits manager of the American Foundrymen's Society, gave some details concerning the 1956 convention and exhibit to be held in Atlantic City, N. J., May 3-9. Heavy demand for display space, he said, points to a large and successful show.

Frank G. Steinebach, editor, FOUNDRY, discussed recent activities of the National Castings Council, with particular reference to developments at Washington.

Some of the things foundry management expects of the foundry equipment industry were outlined by Frank X. Buiold, manager of foundries, Ford Motor Co. Among his recommendations were:

1. Plan a safe margin in the capacity of the equipment and clearly define its maximum limitations.

2. Provide air-tight seals for electrical control panels and incorporate signal lights in the circuits to indicate where trouble is when it occurs.

3. Permit reasonable access for quick maintenance with standard tools.

4. Design guards so that they do not handicap maintenance.

5. Reduce noise levels and improve ventilation.

6. Develop use of segmented automation and in-line operations, particularly in core setting, mold closing and clamping, pouring, cooling conveyors, knockout and finishing.

7. Make available specialized handling equipment to supplement standard products. For instance, the molding machine builder should be able to design equipment for handling flasks and changing patterns.

8. Train the foundry in the proper use and maintenance of the equipment. Whenever possible, the equipment manufacturer should submit a preventive maintenance program.

9. Incorporate flexibility in equipment so that it can be adapted to present fast-changing times.

Progress of the Foundry Educational Foundation was discussed by E. J. Walsh, its executive director. He detailed the sharp increase in facilities and staff for teaching foundry subjects at the 16 engineering schools participating in the FEF program. More than 30 per cent of all engineering students now take at least the basic foundry course.

In the annual election of FEMA officers, David E. Davidson, Link-Belt Co., Chicago, was chosen president to succeed Mr. Wallis. G. E. Seavoy, Whiting Corp., Harvey, Ill., was named vice president and C. R. Heller was re-elected secretary-treasurer. Three new directors elected to the board are R. A. Bracket, Spencer Turbine Co., Hartford, Conn., Thomas Kaveny Jr., Herman Pneumatic Machine Co., Pittsburgh, and Carl R. Sare, W. W. Sly Mfg. Co., Cleveland.

It was announced that the association's 1956 meeting would be held Oct. 18-20. at White Sulphur Springs.

DAVID E. DAVIDSON
President, FEMA

G. E. SEAVOY
Vice President

C. R. HELLER
Secretary-Treasurer

"Electromet" 50% Ferrosilicon

Trade-Mark

for FAST deoxidation

Dissolves fast and saves furnace time

Provides close metallurgical control

Keeps open hearth heats uniform

DENSE PRODUCT — ELECTROMET 50 per cent ferrosilicon is a uniformly dense product. The alloy penetrates the slag without delay and goes into solution fast. This provides fast blocking action and saves furnace time.

UNIFORM ANALYSIS — In every shipment of ELECTROMET ferrosilicon, you obtain a uniform product of dependable chemical analysis. This permits close metallurgical control for open hearth steel specifications.

WIDE RANGE OF SIZES — An adequate range of sizes, for both lump and crushed material, allows you to select the size best suited to your melting practice and melting facilities. ELECTROMET ferrosilicon is uniformly-sized from lot to lot.

Lump sizes are: 75 lb. x 4 in.; 8 in. x 4 in. and 5 in. x 2 in.

Crushed sizes include: 4 in. x ½ in.; 2 in. x ½ in.; 1 in. x ¼ in.; ½ in. x Down; ⅜ in. x 12 Mesh; 8 Mesh x Down; and 20 Mesh x Down.

ANALYSIS AND GRADES OF "ELECTROMET" 50% FERROSILICON

Regular Grade	Silicon . . . 47 to 51%
Blocking Grade	Silicon . . . 47 to 51%
Boron-Bearing Grade . .	Silicon . . . 47 to 51% Boron . . . 0.04 to 0.05% or higher if desired
Low-Aluminum Grade . .	Silicon . . . 47 to 51% Aluminum . . max. 0.40% or 0.10%

A SURE SUPPLY PLUS GOOD SERVICE — ELECTROMET 50 per cent ferrosilicon is ready for immediate shipment from six plants and warehouses conveniently located to serve you. Sufficient stocks are kept on hand to meet the varied requirements of ferrosilicon users. Our staff of experienced metallurgical engineers is always ready to give you technical help. For further information about ELECTROMET 50 per cent ferrosilicon, as well as other ELECTROMET ferro-alloys and metals, please contact the nearest ELECTROMET office listed below.

The term "Electromet" is a registered trade-mark of Union Carbide and Carbon Corporation.

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Industry BRIEFS

CONSOLIDATED FOUNDRIES & MFG. CORP., Chicago, has purchased the high-alloy steel castings and special fabrications divisions of Michiana Products Corp., Michigan City, Ind., which also has sold its oil filter business. The casting and special fabrications divisions account for about two-thirds of Michiana sales and assets. For the time being, all operations will continue at the Michigan City plant, where about 500 persons are employed.

Barclay Foundry Inc., Milwaukee, has purchased Lincoln Grey Iron Foundry Co., Merrill, Wis., which ceased operations recently. Production will be resumed with about 15 employees, and the company hopes to expand its force to 25 or 30 eventually.

Pacific Steel Casting Co., Berkeley, Calif., has been presented an achievement award by the Industrial Indemnity Co. for its on-the-job safety record.

Precision Castings Corp., Syracuse, N. Y., will construct a $6 million plant in Salt Lake City next year for the manufacture of industrial couplings. The plant will be operated jointly by Precision Castings and Utah Automatic Quicklock Coupling Corp. Another jointly operated plant has been proposed for Syracuse, where Precision already has one facility.

Ajax Engineering Corp., Trenton, N. J., has concluded an agreement with Otto Junker GmbH., Lammersdorf, Germany, and Birlec Ltd., Birmingham, England, to develop and market a line-frequency (60-cycle) coreless induction melting furnace. The unit is expected to be of particular interest to foundrymen melting high-strength irons.

Detroit Brass & Malleable Co. has enlarged its Chicago warehouse facilities at 3407 South Archer Ave., to provide for expanding inventories. Offices were moved from the first to the second floor and will be air conditioned.

Ferro Machine & Foundry Inc., Cleveland, has acquired the assets and business of Falls Welding & Mfg. Co., Newton Falls, O. Falls Welding manufactures welded fabrications of earth-moving equipment, parts and assemblies. Marleston Welded Products Inc., a jobbing machine shop in Warren, O., and a subsidiary of Falls Welding is included in the sale. No changes in personnel or location are contemplated.

Harbison-Walker Refractories Co., Pittsburgh, has purchased an interest in Fabrica de Ladrillos Industriales y Refractarios, S. A. (Flir) of Mexico. The firm is a subsidiary of Cia. Fundidora de Fierro y Acero de Monterrey, S. A. Its name will be changed to Harbison-Walker-Flir, S. A.

Consolidated Brass Co., Detroit, is moving its plant to Charlotte, N. C., and expects its new foundry there to go into operation about Jan. 1. About 25 employees will be brought from Detroit, and eventual employment of 250 is planned.

Foundry Chemicals Corp. has been formed in Milwaukee with authorized capital stock of 20,000 shares of common at par value of $1 per share. Registered agent is Robert P. Harlend, 735 North Water St., Milwaukee 2.

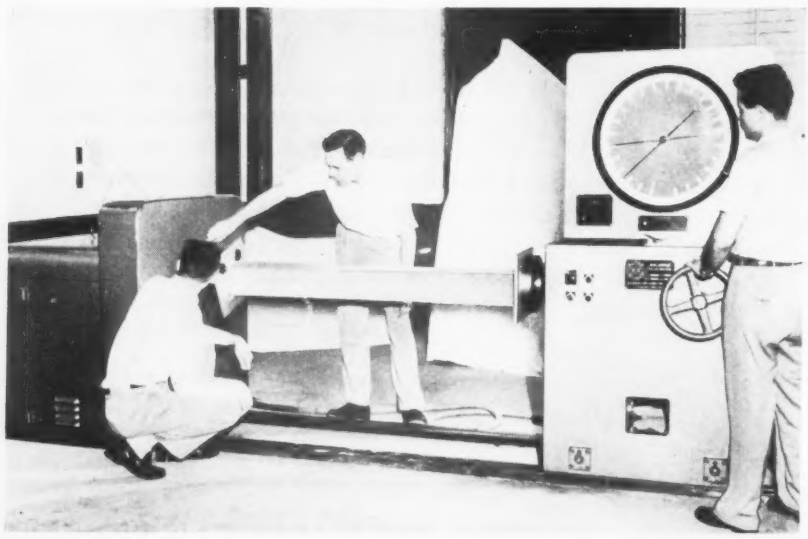
Western Foundry has begun operation of a new $200,000 plant in Longmont, Colo., currently employing 39 men. Built of steel and cinder block, the structure is 90 ft wide and 278 ft long.

Alvey - Ferguson Co., Cincinnati has appointed J. H. Overpeck Co., 1112 House Bldg., Pittsburgh 22, to distribute its complete line of conveyors and industrial washers.

Automatic Switch Co., Orange, N. J., has appointed Morlane Co., P. O. Box 2249 (Pierce at Second St.), Amarillo, Tex., to be a distributor of the firm's solenoid valves.

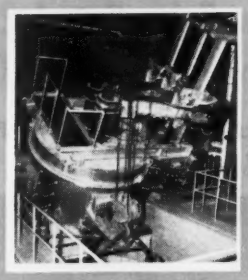
Triangle Core Service, 13545 South Western Ave., Blue Island, Ill., has added shell cores to its core services throughout the Chicago area.

Lake Shore Foundry Co., 653 Market St., Waukegan, Ill., was badly damaged by fire on Sept. 16.



TORSION TESTING: Newly installed in the University of Virginia's materials testing laboratory at Charlottesville, Va., this torsion testing machine is one of the first in which torsion measurements are made electrically with an Sr-4 resistance wire strain gage device. Built by Baldwin-Lima-Hamilton Corp., Philadelphia, the machine is of 60,000-in.-lb capacity and will be used by undergraduate students to study torsional strength of solid and hollow shafts and certain aircraft structures

• ONE OF A SERIES OF MESSAGES TO MODERN FOUNDRY MANAGEMENT



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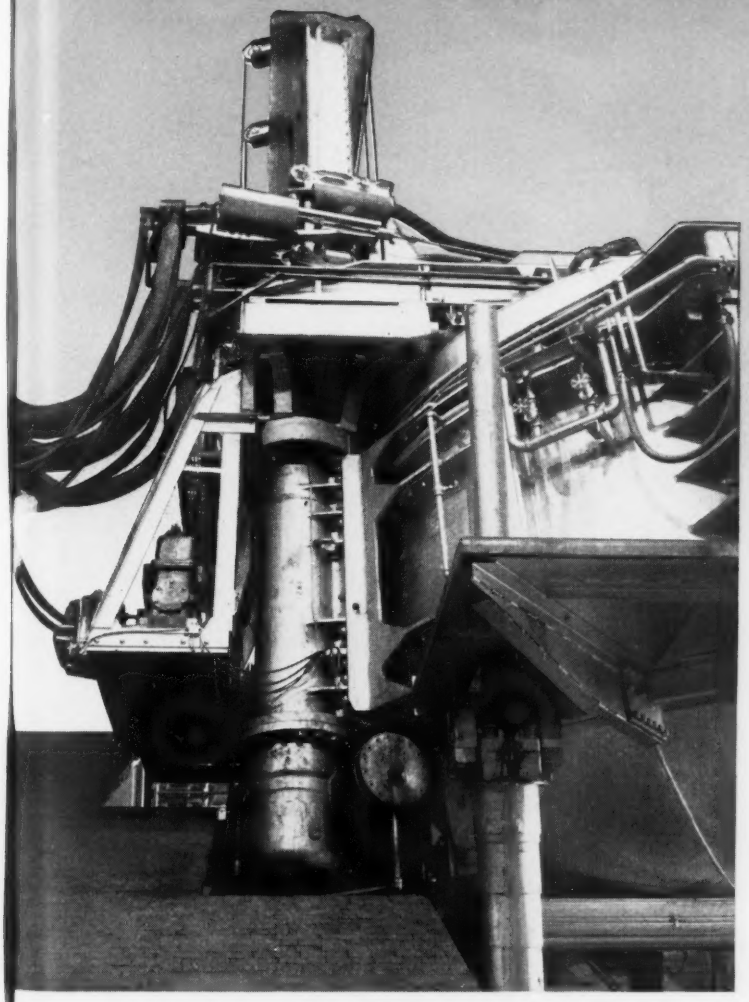
FOUNDRY ELECTRIC MELTING FURNACES



RUGGED OVER-SIZED ROOF CYLINDER

–Another SWINDELL Quality Feature for Fine Furnace Performance

OUTSTANDINGLY SUPERIOR in design, construction and operation, the SWINDELL hydraulic roof lift and swing cylinder is a major operating feature. Perfect alignment, always, is assured by attachment to furnace shell. Permanent engagement with roof superstructure guarantees proper sequence. No manual clamps or kingposts, no special foundations or pits for piping—instead, a single massive unit integral with the furnace, powerful, dependable, smooth in operation year after year. You can depend upon SWINDELL experience. Let it serve you in the foundry field.

SWINDELL Electric Melting Furnaces for foundry service provide the productivity, low maintenance and long, useful life built-in by genuine steel mill design and construction by steel mill melting furnace specialists. Write for a consultation.

WRITE for your copy of the latest Swindell Electric Melting Furnace Catalog — sent promptly on request.

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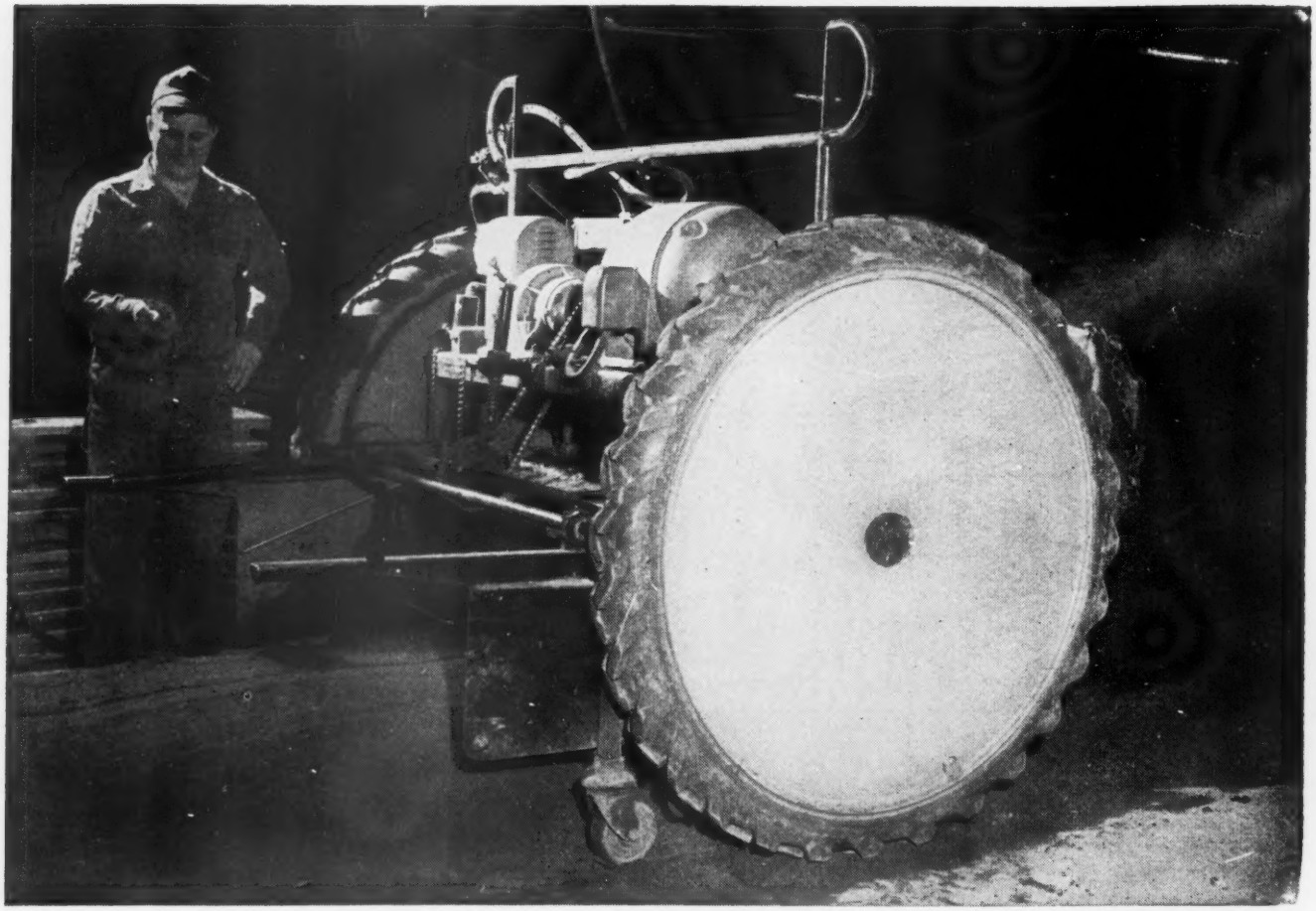
Designers and Builders of Modern Industrial Furnaces
PITTSBURGH 30, PA.

IN TUNE WITH THE TIMES WITH *"The Moulders' Friend"*



Costs rise higher and higher every year. To keep in tune with the times we must find cheaper ways to do the job better.

Foundrymen who use The Moulders' Friend sand conditioner agree that the thousands of flat tempered steel wires in the brush revolving at high speed do the most thorough job of mixing and aerating sand heaps on the foundry floor.

The Moulders' Friend is completely self-propelled. It has a capacity of two tons of thoroughly conditioned sand per minute with travel speeds up to 50 feet per minute. One man does the job.

A screen for removing trash and tramp iron and a water dispenser for accurately wetting down the sand as the machine travels over the heap are valuable added features.

The Moulders' Friend fits your foundry. Being carried on two large wheels it turns short and handles well in the crowded foundry.

The Moulders' Friend will help you keep in tune with the times by paying for itself with better castings and less labor cost. Try a Moulders' Friend in your foundry.

Ask For Our Special Proposition

THE BRUSH DOES THE JOB

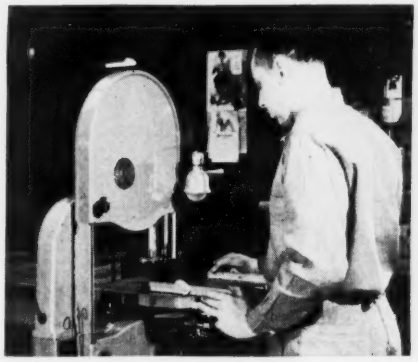
"The Moulders' Friend" • Dallas City, Illinois

Select Band Saw Blades By Job They Are To Do

Number of Teeth, Set and Operating Speed Vary

BAND saw blades for metal-cutting should be selected by the material to be cut, Rockwell-Delta power tool experts advise. Such factors as number of cutting teeth, their set and operating speed vary with the particular job to be done. Metallic hose, for example, is best cut at only about one-tenth the speed used for canvas and rubber hose and requires about twice as many teeth per inch.

Metal sawing requires slow speed, except in the friction sawing technique which uses a high-velocity blade speed. For conventional sawing, however, blade speed should be in the neighborhood of 200 sfm for average work. Steel requires a slower



speed than soft metals, and thick sections demand a slower speed than thin sections. When blade speed is too high, teeth do not have time to bite into the metal. The result is a skidding, rubbing action which fails to cut the metal and rapidly dulls the blade. As a rule of thumb, the softer a metal is, the higher the cutting speed should be.

Two Teeth Should Contact Work—Blades for cutting thin metal should be selected so that at least two teeth always are in contact with the edge of the work. If teeth are allowed to straddle the work, they will be torn off and the blade ruined.

Three different styles of set commonly are used for metal-cutting blades. Blades with every tooth set, alternating right and left, are similar to wood-cutting blades. This style of set can be used for cutting all softer metals. "Regular" or "raker" set blades have one unset raker tooth to each pair of set teeth, the raker tooth serving to keep the cut clean. Such a set is used for gray iron, steel, Monel, etc. In blades with a "wavy" set, the teeth are set in groups, one set forming a wave to

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High in carbon—low in sulphur—uniform in carbon absorption—low in ash—Matchless in performance!

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THE TABOR MAN TM

The Tabor Man is a Technical Man. He is not an "order-taker", nor one who has no sand in his shoes. He knows the foundry business, and the answers to most of the problems which arise in this complex industry. He recognizes signs of obsolescence in foundry operations, and can prescribe intelligently to combat them. He knows how, when and where to modernize, mechanize, or install automation. He is able to weigh the economics of systems and procedures in the light of production schedules. And he knows that you can often buy a machine and borrow a big headache at the same time.

The services of the Tabor Man — the Trained Man — are available to you, without any obligation at all. Take the Tabor Test at the right, and see if his counsel and guidance would be helpful.

Tabor — Established 1884. Division of Turbo Machine Company — December 1954

TM

IS A TECHNICAL MAN

TAKE THIS TABOR TEST

Think carefully about these questions — in terms of *your own operations.* Then answer the questions objectively TRUE or FALSE. If you have 5 TRUE answers you can count yourself in very good shape. One answer in the FALSE column means that you might well take a fresh look at your operations — because these 5 M's are the bench-marks of profitable foundry practice.

	T	F
MACHINES My foundry machines work at optimum rates. They show no signs of obsolescence.	☐	☐
MEN My men are as productive as it is possible to make them. There is no waste manpower.	☐	☐
METHODS My foundry methods can't be improved. There are no antiquated practices or tradition at work in my plant. And setting cores, pouring, cooling, shakeout and disposition of castings are no problem in my plant.	☐	☐
MATERIALS The materials used in my foundry are the best and most modern available. I can see no reason to change them	☐	☐
MECHANIZATION I can't see this mechanization business. I don't see how I can increase productivity by substituting mechanical devices for some manual operations	☐	☐

The Tabor Man would be happy to discuss your foundry operations with you. This can be as brief as you want it to be, and there's obviously no obligation of any sort. Why not save yourself time and trouble by getting in touch with us?

The **TABOR** Manufacturing Co.
Lansdale, Pa.
Division of Turbo Machine Company

the right, the next set a wave to the left. This type of blade is used extensively for cutting thin metals such as pipe, metal tubing and radiator cores.

Recommended for the General Shop—For a small or general shop, Delta technicians say a good selection of blades should be those with 14, 18 and 24 teeth per inch, with the 18-tooth "regular set" blade best for all-around work. Coarser toothed blades are excellent for softer metals, such as copper, brass, aluminum, etc., and the 24-tooth blade is good for cutting thin sheet stock in any metal. Hard-edged blades should be discarded when worn since it is not practical to sharpen them.

A blade must be selected with regard to the sharpness of curves it must cut. A ½-in. blade cannot cut a circle less than about 6 in. in diam; a ¼-in. blade will cut a radius of about 1 in. No table of radii capacity can be accepted as other than an approximation. Since most metal-cutting is in the form of straight lines or mild curves, the best all-around blade is ½ in. wide.

For special work, the following specifications are suggested as an approximate guide. Recommendations are based on average conditions; users operating under special conditions may find that slight variations in speed, teeth or set will increase cutting efficiency or blade life.

SUGGESTED BLADES AND SPEED

Material	Speed Ft per minute	Teeth	Set
Aluminum-alloy gates	125	8–10	ETS *
Aluminum sheets	2200	8–10	ETS
Asbestos sheets	125	8–10	ETS
Babbitt	340	10–14	Reg. **
Bakelite	340	5–10	ETS
Brass; cast, soft	310	12–14	ETS
Brass; cast, hard	125	18	Wavy***
Brass sheets and tubing	340	14–18	ETS
Bronze; manganese, etc.	125	10–14	Reg.
Bronze moldings	175	18–24	ETS
Builders board	2200	12–14	ETS
Brake lining	125	8–12	ETS
Carbon tool steel	80	14	Reg.
Cast iron	125	14	Reg.
Cold-rolled steel	175	14	Reg.
Copper	175	10–12	ETS
Drill rod	80	14	Reg.
Fiber	340	8–10	ETS
High-speed steel	80	14	Reg.
Hose; canvas and rubber	2200	8–10	Wavy
Hose; metallic	250	18–22	Wavy
Iron bars; machine steel	175	10–14	Reg.
Iron sheets	175	18–22	Wavy
Malleable iron	175	12–14	Reg.
Plymetal	175	14	ETS
Mica	175	10–14	ETS
Monel metal	125	10–12	Reg.
Nickel steel	80	12–14	Reg.
Pipe	125	18–22	Wavy
Radiator cores	340	18–22	Wavy
Rubber; hard	340	10–14	ETS
Slate	80	10–14	ETS
Steel moldings; special shapes	125	18–24	Wavy
Steel tubing	125	18–24	Wavy
Transite	175	14–18	Reg.

* ETS: Every Tooth Set
** Reg.: Regular Set
***Wavy: Group Set

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A 2 " molasses gate may be used instead of a pump if desired or if pump is not available.

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HOUSTON DENVER

First Design Engineering Show Scheduled for Philadelphia

The first Design Engineering Show, devoted exclusively to the needs of engineers who design products for either consumer or industrial use, will be held at Convention Hall, Philadelphia, May 14-17, 1956. Clapp & Poliak Inc., New York exposition firm, will manage the event.

Various types of original equipment which go into the manufacture of a finished product will be on display at the show. Exhibits will include parts, components, finishes and basic materials, testing machines, x-ray machines and other equipment with specific design engineering applications. To supplement exhibits, a conference will be conducted at which papers will consider various applications of design engineering.

A total of 73 industries is expected to have a strong interest in the exhibits and the conference. Included in the total are makers of die casting, sand foundry, heating, materials handling and hydraulic and pneumatic equipment. Design engineers and executives who wish to obtain advance registration cards or hotel information should write to Clapp & Poliak Inc., 341 Madison Ave., New York 17.

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at a fraction of replacement cost

Costly electrode holders, bus tubes and cooling clamps no longer need be discarded when they become badly burned, pitted or scarred. These pieces of equipment may be restored to a condition corresponding to the original drawings and specifications at a fraction of the cost of a replacement unit. Wilson Welding Company's new method, using a patented process of fusion welding of copper and copper alloy, now makes possible the repair and rebuilding of holders, bus tubes, bus bars or other burned or damaged copper component parts on all types and makes of electric arc melting and smelting furnaces.

Pictured below left is a badly burned electrode holder as it was received at the Wilson Welding Company plant for rebuilding, and below right is the same holder as it appeared ready for return to the customer and long years of additional service at a fraction of the cost of a new holder.

★ Repair prices are based upon the amount of labor and material cost involved.

★ If desired, an estimate of costs determined by our inspection of the holder will be submitted before proceeding with repairs.

★ Orders for holder repairs should be accompanied by a drawing or sketch showing dimensions.

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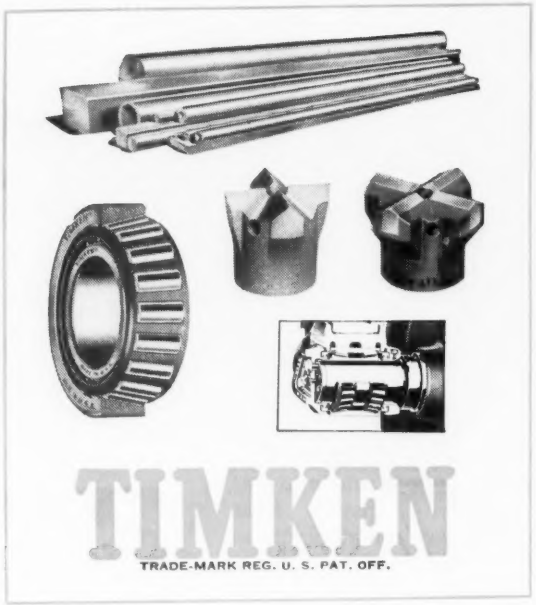
The trade-mark "Timken" helps us protect this reputation. It identifies the products made by the Timken Company. And this legal identification protects *your* reputation as well as ours. By specifying "Timken" you can always be sure of the high quality you've come to expect from products of the Timken Company. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



TAPERED ROLLER BEARINGS • REMOVABLE ROCK BITS • FINE ALLOY STEELS

INVESTMENT FOUNDERS HOLD MEETING

To Discuss Progress and Future of the Industry

By ROBERT H. HERRMANN
Associate Editor

OVER 120 members of the Investment Casting Institute convened at the Sheraton-Cadillac Hotel, Detroit, Nov. 1-3 for their third annual meeting. Director and committee meetings were held the first day, technical sessions filled the second day and Nov. 3 was devoted to business sessions.

V. S. Lazzara, Casting Engineers Inc., Chicago, was elected president for the coming year. R. S. Banister, Midwest Foundry Co., Coldwater, Mich., is vice president. New members of the board of directors include Ted Operhall, Misco Precision Casting Co., Whitehall, Mich., retiring institute president; P. W. Schipper, Howard Foundry Co., Milwaukee; W. A. Dubovick, Engineered Precision Casting Co., Matawan, N. J.; W. L. Worthen, Bone Engineering Co., Burbank, Calif., and Robert R. Miller, Precision Metalsmiths Inc., Cleveland.

Arthur C. Williams, Crucible Steel Co. of America, Harrison, N. J., and K. W. Thompson, K. W. Thompson Tool Co., New Hyde Park, L. I., N. Y., continue on the board. Harry P. Dolan, Chicago, continues in active management of the institute's affairs under the new title of executive director.

First presentation at the technical session was a discussion by Roger F. Waindle, Wai-Met Engineering Co., Muskegon, Mich., of the work being done by the Metal Specifications Committee in developing institute specifications. The intent of the committee is to develop a hallmark for investment foundries and enable them to produce better castings at better prices.

Dean K. Hanink, Allison Division, General Motors Corp., presented the first paper, **Current Investment Casting Applications for Aircraft Engines.** Currently investment cast parts are confined mainly to the hot end of the gas turbine. However, tests indicate that investment castings are stronger than forgings for such parts as turbine blades. Castings show weight savings in turbine cases and burner supports.

Primary use of investment castings in future engines is expected to be as large structural components. Casting quality must be improved, however, if cast parts are to remain competitive, and foundrymen must sell designers and engineers on the benefits of castings.

Use of Castings in the Automotive Gas Turbine were discussed by Donald N. Frey, Ford Motor Co. Present experimental turbine engines use investment cast nozzle vanes and blades for compressor turbine wheels. In both cases the cost is too high for a production engine. Dr. Frey suggested that the cost of individually cast blades would have to come down to a maximum of 15 cents above metal cost per blade before investment cast blades could be considered.

Many other parts of the engine are planned as castings and some meet requirements of strength, heat resistance and cost. Others, however, while they meet performance specifications, are too costly. Casting quality and foundry techniques must be improved if cast parts are going to compete with forgings costwise.

An exchange paper prepared by Walter H. Sulzer, Sulzer Brothers, Winterthur, Switzerland, entitled **Trends and Problems of the European Investment Casting Industry** was presented at the luncheon meeting by George W. Cannon Jr., Cannon-Muskegon Co., Muskegon, Mich. Mr. Sulzer pointed out that there are 46 investment foundries in Europe, most of them in Great Britain, Germany, France and the Netherlands. Because of the absence of a significant air-

New ICI officers and directors gathered around a table for their first meeting are, left to right: R. S. Banister, vice president; W. A. Dubovick, director; K. W. Thompson, director; Harry P. Dolan, executive director; V. S. Lazzara, president; Ted Operhall, director and immediate past president; P. W. Schipper, director; A. C. Williams, director; R. R. Miller, director, and W. L. Worthen, director

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Workers will wear them willingly—with the Willson "Super-Tough" lenses prescription ground, if desired—because these new styles are as handsome as frames can be!

A full range of eye, bridge and temple sizes have been developed into attractive eyewear by the Willson Research Center. Ask your Willson distributor to show you the WF line soon.

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new wide-vision frame shape in flesh-color butyrate; spatula or half plastic-half cable temples

Style WFD

demi-amber wide-vision butyrate frame; matching spatula temples

Style WFB

popular Willson Bronze, wide-vision frame; spatula or half plastic-half cable temples

Style WFH

wide vision lenses, spatula temples—in new half-frame design (demi-amber overlay on upper half of crystal butyrate frame)

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craft industry in those countries, except for Great Britain, the foundries had to develop new markets.

European foundries are using polystyrene patterns because of their accuracy and lower production costs. Also there is a strong trend to replace alcohol-base binders with water-soluble binders such as phosphoric acid and cement.

Afternoon session started with E. G. Chapman, Misco Precision Casting Co., who is chairman of the Dimensional Tolerances Committee, pre-

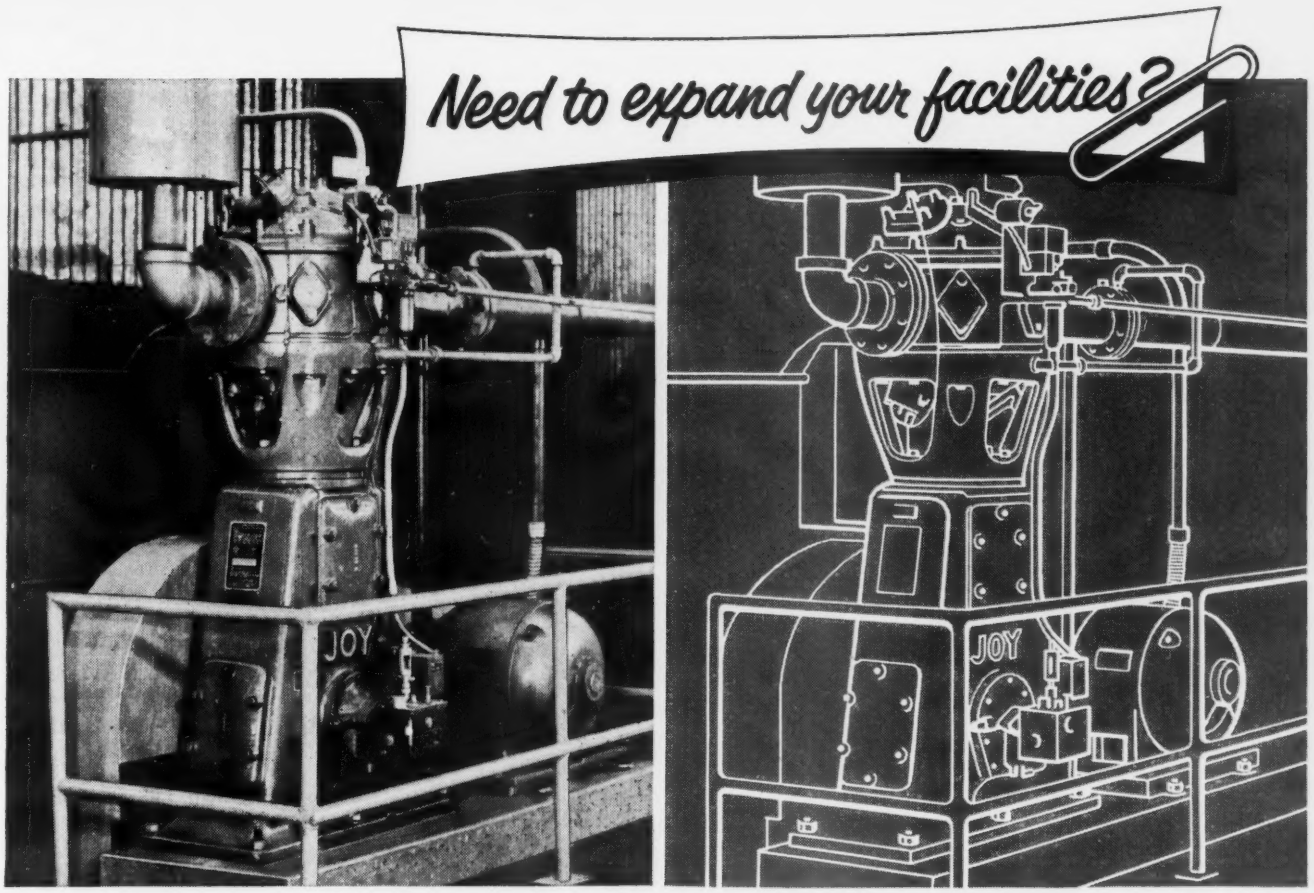
V. S. LAZZARA
President, ICI

senting the institute's plans to publish a national investment casting design manual to be made available to any interested person.

Richard A. Flinn, University of Michigan, gave a paper on the **Relation of Solidification Pattern to Casting Quality.** He discussed the effects of fluidity, feeding and gas evolution on quality. Fluidity of all metals can be the same if their pouring temperatures are the same number of degrees above the freezing temperature. Feeding problems can be reduced if proper ratios are maintained between the riser volume and the casting volume, and between casting cooling rate and riser cooling rate. The latter ratio should be greater than one. He added that, in general, a riser will feed a distance of 4½ times its thickness.

For reducing gas evolution problems he suggested melting in a reduced pressure or argon atmosphere.

A review of the Glascast, Ellis, Shaw and Investment X processes was given by Nicholas J. Grant, Massachusetts Institute of Technology. The Glascast process involves the use of matchplates to produce a dense plaster mold. A porous plaster pattern is made in the dense plaster mold. Then the final mold is made by pouring a slip of four parts of minus 325 mesh glass powder and



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The Joy WG-9 *heavy-duty* vertical air compressor is a natural for supplying additional air for an existing system, either centralized or decentralized.

Because of its smooth running characteristics and the small floor area required, the WG-9 needs only a simple, block-type foundation. The average base dimensions of a larger model WG-9, *including motor,* are 7′1″ by 4′1″. This means greater capacity per square foot of floor area—42 CFM per square foot on the 100 psi rated machines.

Thus, the WG-9 packs large compressor capacity in a small compressor area. It is possible to install the machine in a central compressor room where unused floor space is at a premium, or in a decentralized plant location where crowding of machinery is a problem.

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one part water over the porous plaster pattern. Water is absorbed by the pattern and the resulting glass shell is removed and dried in an oven. Such molds have a low coefficient of expansion and produce castings of 40 microinches finish and close tolerance. Biggest problem is in variation across the parting line.

Dr. Grant briefly mentioned the Ellis process, saying it is a combination of the plaster and investment casting processes which supposedly produced castings with finishes of 25-30 microinches.

The Shaw process involves the use of a mold material consisting of ethyl silicate and a refractory, which passes through a pliable stage during solidification and can be stripped off a pattern having slight undercuts. The molds are ignited for drying before the metal is poured.

Molds for the Investment X process incorporate a mixture of ethyl silicate and a ceramic material called molochite. The wax pattern assembly is spray or dip-coated a number of times to build up a refractory shell. After formation of the shell, the wax is removed by immersion in trichlorethylene vapor at about 120°F. The finished mold is packed in a canister with dry refractory material for pouring.

B. W. Duncan, Alloy Precision Castings Co., Cleveland, and chairman, Physical & Nondestructive Testing Committee, related progress on getting the ICI standard test bar adopted by the American Society for Testing Materials.

Chairman of the Process Materials Standards Committee, W. A. Dubovick, Engineered Precision Casting Co., told of the committee's work on developing standard tests.

Book Review

Brazing Manual, prepared by Committee on Brazing and Soldering, American Welding Society, cloth, 6 x 9 in., 183 pages, published by Reinhold Publishing Corp., 430 Park Ave., New York 22. Price: $4.75 to nonmembers of American Welding Society, $3.80 to members.

Book contains information on eight brazing processes with recommended techniques, including equipment, precleaning, surface preparation, postbraze cleaning and inspection for all metals of industrial importance. Appendix in chart form lists properties of brazeable metals and alloys. Brazing fluxes and atmospheres are standardized into types according to compositions and uses. Production, design, quality control, safety, health protection and detailed explanations of causes of defects and how to correct them also are included.

Obituary

EDGAR C. KREUTZBERG, 68, for the last 12 years Washington editor for FOUNDRY and other Penton publications, died there Nov. 13. Born in Milwaukee, Mr. Kreutzberg spent his early years in Trenton, N. J., and was graduated from Princeton in 1910. Shortly after he joined the Penton Publishing Co. He was eastern editor in New York for *Steel* from 1911 to 1934, and served as its engineering editor in Cleveland until 1937 when he was made editor. In 1943 Mr. Kreutzberg was placed in charge of Penton's Washington office to represent all of its publications there.

E. C. KREUTZBERG

Earl C. Petrie, 52, director of research, North American Refractories Co., Celveland, died Nov. 2. He joined the company in 1940 and became director of research in May. He was graduated from Ohio State University and prior to joining North American Refractories Co., he was recipient of a refractories fellowship at Mellon Institute, Pittsburgh.

John F. Steeves, 79, founder and owner, Corbett - Steeves Pattern Works, Rochester, N. Y., died Oct. 22. A native of Canada, he went to Rochester as a boy and organized the pattern works in 1918. Active in the Rochester Chapter of the AFS, he was a member of its auditing committee.

Martin A. Fisher, 70, executive vice president-treasurer, Standard Buffalo Foundry Inc., Buffalo, died Oct. 25. Mr. Fisher was a director of the Gray Iron Founders' Society in 1941-42 and a member of the executive board of the Inter-Allied Foundries of Erie County, Buffalo.

Edison L. Wheeler, 68, president, Wheeler Protective Apparel Inc., Chicago, died Oct. 31. Mr. Wheeler was a director of National Safety Council and a former president of the Industrial Safety Equipment Association.

John G. Malnoski, until recently president, Muncie Malleable Foundry Co., Muncie, Ind., died Oct. 2. For many years Mr. Malnoski was active in the affairs of Malleable Founders' Society and was a former director.

John H. Schuler, 60, sales manager, Albany Casting Co., Voorheesville, N. Y., died Oct. 30. He was formerly a vice president, Jewell Steel & Malleable Co., Buffalo.

William N. Leininger, 66, for the past 12 years foundry superintendent, Perlick Brass Co., Milwaukee, died Oct. 29.

George W. Duncan, 56, sales manager, Ohio Electric Mfg. Co., Cleveland, died Oct. 25.

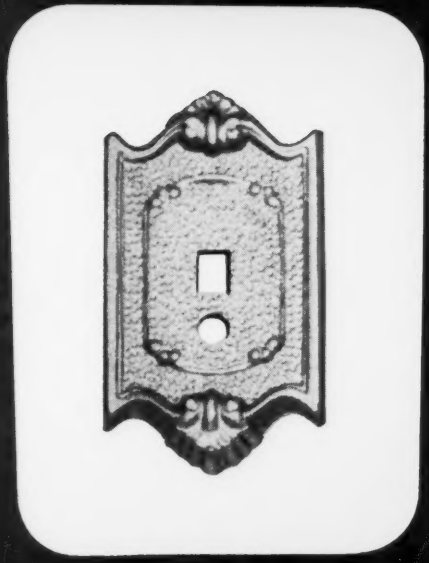
Nine New Instruments Measure Los Angeles Air Pollution

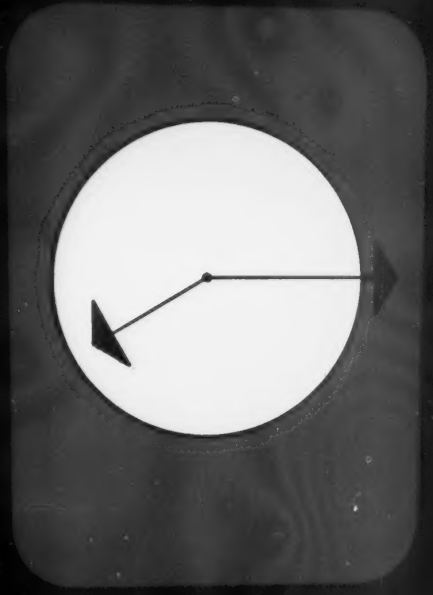
Nine instruments have been conceived, adapted or sponsored by the Air Pollution Foundation, Los Angeles, to speed the day when smog will be understood completely and brought closer to elimination. These instruments are finely tooled, carefully calibrated measuring and recording devices designed to save time in the race against smog.

High on the foundation's list of achievements is a 4-in-1 unit, a 6-ft cabinet of glass tubes and control dials now in operation 24 hours a day, seven days a week, in a laboratory at California Institute of Technology. It measures and records concentrations of four pollutants—oxidant, oxidant precursor, nitric oxide and nitrogen dioxide. Amounts of these pollutants in the atmosphere are recorded on a single roll of graph paper, allowing scientists to make side-by-side comparisons. The one instrument combines three separate devices introduced during the past year.

Other instruments include an ozone radiometer, an ultrasensitive carbon monoxide recorder, a hydrocarbon recorder, a "photo-electronic aerosol particle counter" and a specially constructed aero-meteorograph.

it takes only 15 minutes to do 5 hours' work





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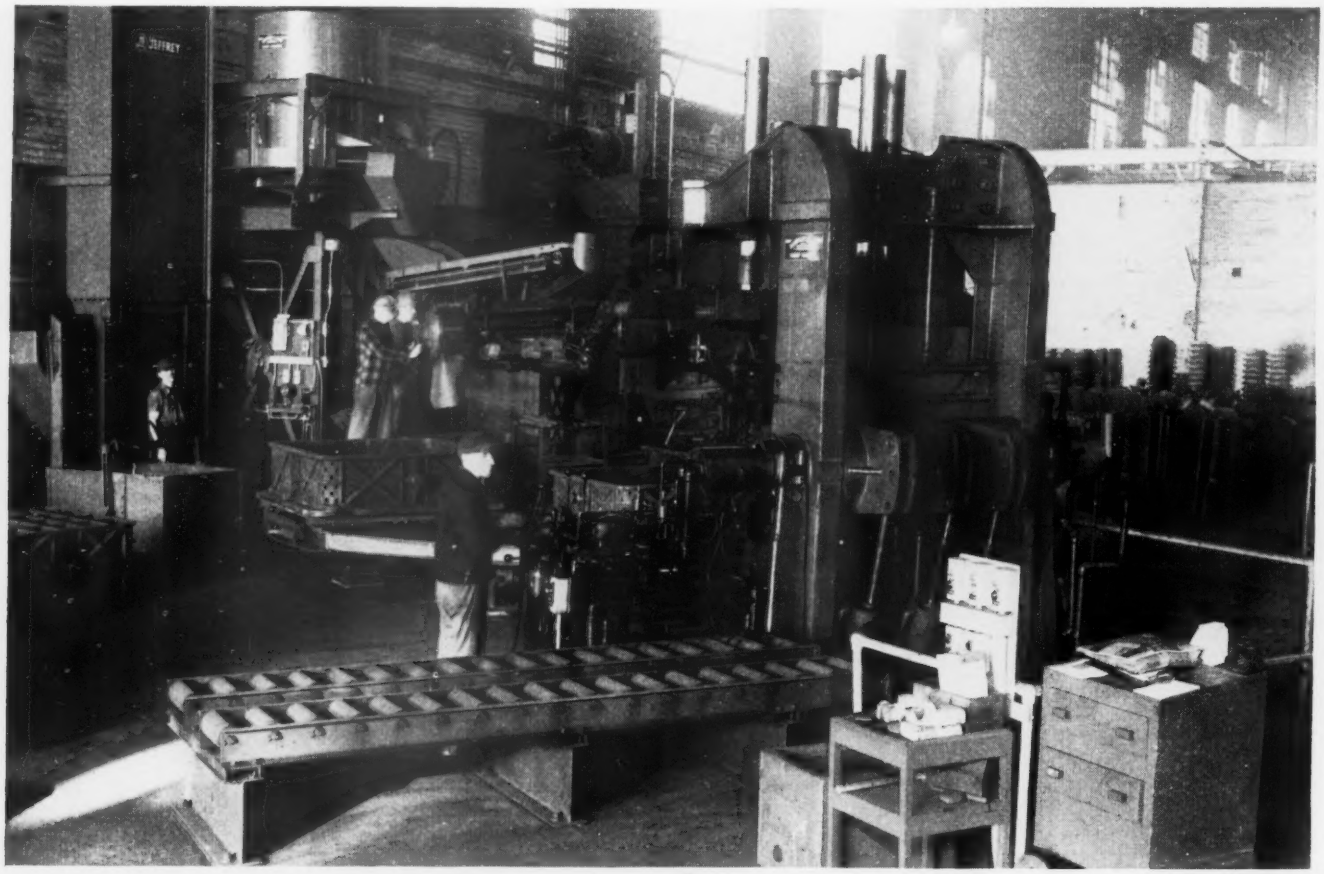
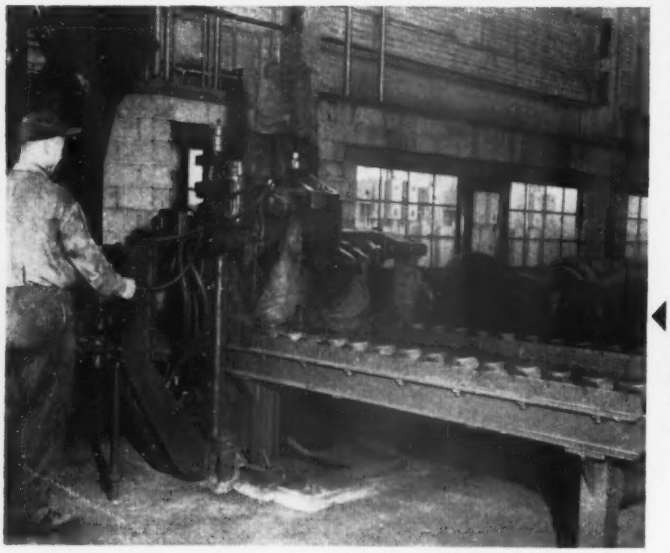
Speaking of Rollover Machines . . .

As more and more jobbing foundries mechanize their molding production — the rollover machine becomes increasingly important. But, now rollover machines must have flexibility and range of operation that was never required before. They must handle molds of greatly varying size at high speeds and they must do their job accurately.

The new B & P Rol-A-Draws and Jolt Rol-A-Draws are designed specifically to meet these needs. Precision and flexibility are built into these machines in addition to full automatic cycle control, automatic flask equalization, automatic flask height adjustment and many other features.

The new B & P Rol-A-Draws are built to meet an unusually wide range of requirements. There is a size and model to fit into any molding unit . . . capacities to 10,000 lbs. and draws to 30 inches.





HEAVY PIPE FITTINGS at the National Iron Division of Canada Iron Foundries are made on this Sandslinger-Roto-Mold molding unit equipped with B & P 6024 Rol-A-Draw. All of the molds are rolled over and drawn on this machine which has a draw of 24 inches and a capacity of 6,000 lbs. The molds are rolled directly from the Rol-A-Draw to a finishing conveyor, while patterns are returned on the Rol-A-Draw to the turntable.

CORES FOR THESE PIPE FITTINGS at National Iron are made on this B & P Jolt Rol-A-Draw. A Model 920, it has a capacity of 2,000 lbs. and has a full 20 inch draw. Automatic height adjustment to core boxes of varying heights is important since a wide variety of different core boxes are handled. The foundry uses three Jolt Rol-A-Draws of this type for this work.

BEARDSLEY AND PIPER DIVISION PETTIBONE MULLIKEN CORPORATION
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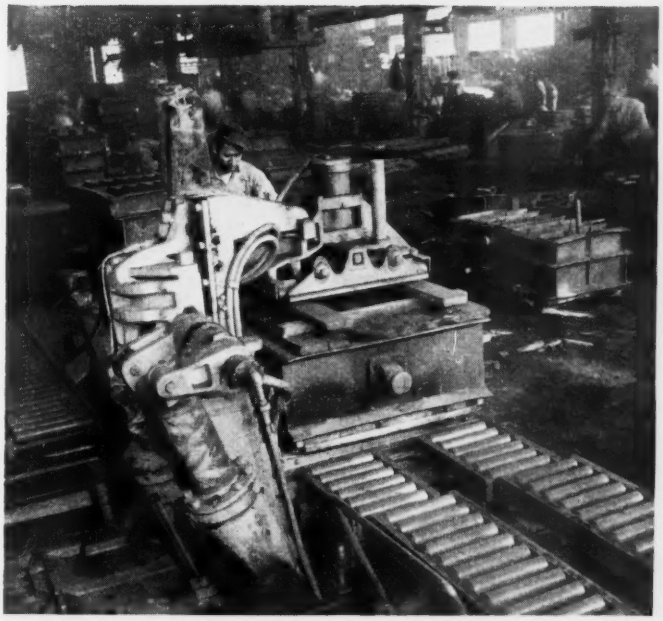
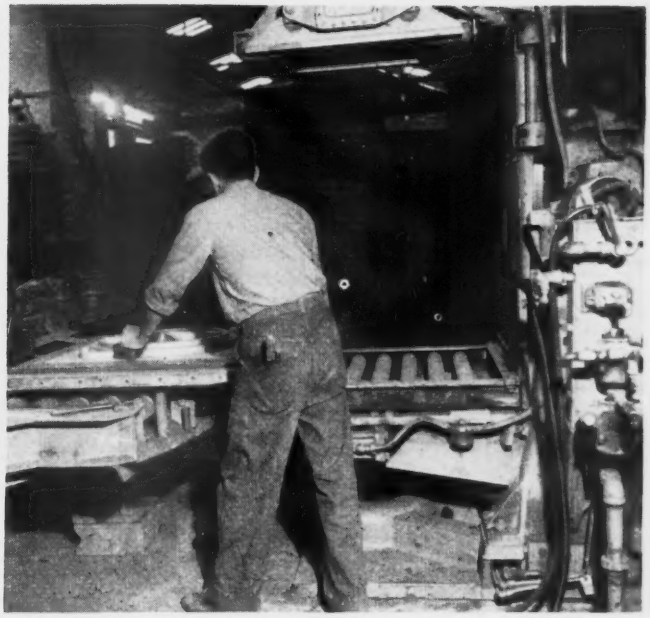
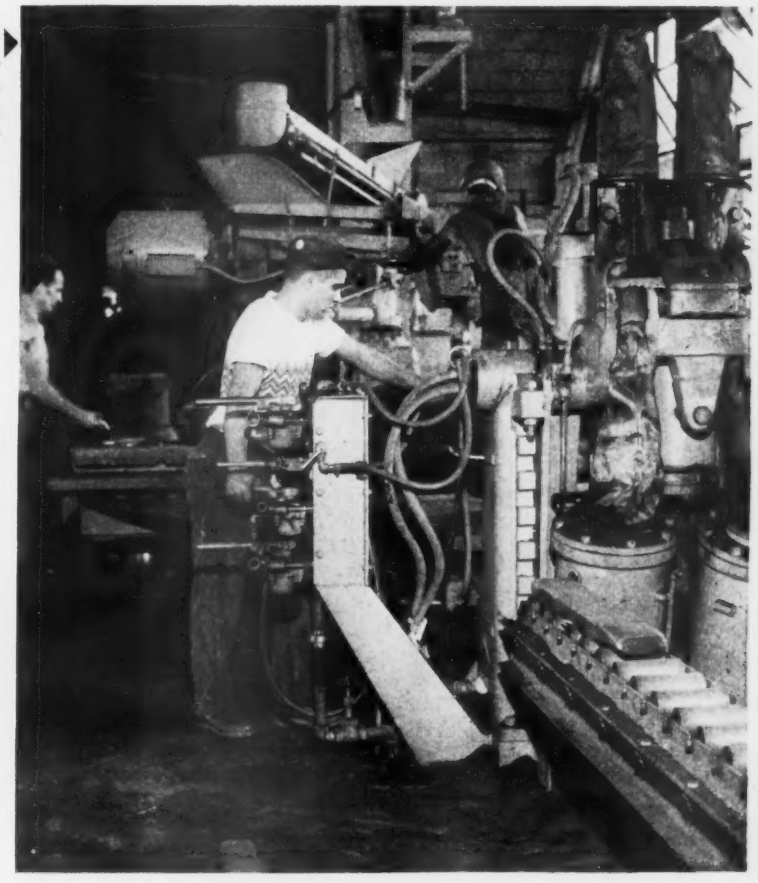


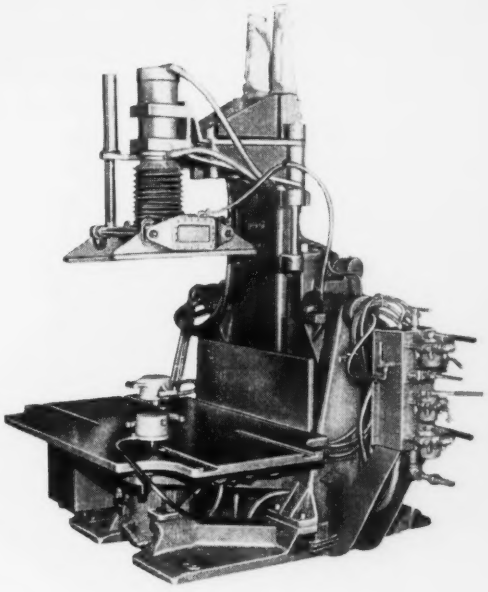
JOBBING WORK is handled at high speed on this B & P 1020 Rol-A-Draw at Casting Service Corporation, La Porte, Indiana. Large molds are slinger rammed on the roller conveyor leading into the Rol-A-Draw. The molds are rolled over and drawn and the patterns are rolled back by the machine. This Rol-A-Draw has 180 degree roll-in and roll-out — one of several combinations available with these flexible machines.



A LARGE VARIETY OF STEEL CASTINGS—primarily for marine work — can now be produced more efficiently than ever before at the Service Foundry of New Orleans with their Sandslinger-Roto-Mold molding unit. Much of the success of this unit is due to this B & P 920 Rol-A-Draw machine which rolls over and draws all of the molds made on the unit. This Rol-A-Draw has a 90 degree roll-in and a 180 degree roll-out. It's "custom-designed" for this molding unit.

COMPACT is the one word that best describes the slinger unit installation at the Pekin Foundry, Pekin, Illinois. Compactness is also one of the characteristics that makes this B & P 920 Rol-A-Draw so suitable for this installation. It's installed without pits too and that makes installation far easier and less expensive. This Rol-A-Draw has a 90 degree roll-in and 90 degree roll-out.





The new B & P 920 Jolt Rol-A-Draw featuring automatic cycle control, automatic pattern clamping, and automatic flask equalization and height adjustment.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

Foundry Developments

By EDWIN BREMER
Metallurgical Editor

FORMATION of intricate passageways, such as oil channels, in aluminum and magnesium alloy castings is being accomplished by use of refractory core materials formed into the desired shape, instead of using tubing or drilling operations. The core is pulled out after the casting solidifies.

Resists Molten Aluminum

CERAMIC paper made from an aluminum silicate fiber by Carborundum Co., Niagara Falls, N. Y., is said to be quite resistant to penetration by molten aluminum. It is being used as a liner between coils and refractory in an induction furnace in which aluminum is being melted. It also is applied to line the spout on the furnace as well as the cast iron pouring ladle. The ceramic paper, termed Fiberfrax, is made in rolls and sheets and is said to retain its form and properties up to 2300°F. Thicknesses of paper are 0.80, 0.40 and 0.020-in.

Better Properties

SAND-CAST No. 220 aluminum-base alloys, reported to have better mechanical properties than the commercial alloy of the same designation, have been produced by a process described in a report of Army-sponsored research just made available by the Office of Technical Services, U. S. Department of Commerce, Washington 25. The report is designated PB 111699 "Development of Sand-cast Aluminum-base Alloys Having Improved Properties" Final Report, July, 1954. It contains 74 pages and the price is $2.

Forms Nodules

BRITISH patent No. 734,953 describes application of chlorides, bromides, iodides or fluorides of sodium, lithium, magnesium, strontium, barium, rubidium and cerium plus a reducing agent to produce nodular graphite cast irons. Preferred materials for nodularization are anhydrous sodium chloride and magnesium chloride, singly or in combination with calcium silicide as the reducing agent. Nodularizing agent and the reducing agent are mixed together and may be added to the molten metal stream or to the molten metal contained in a ladle, or the molten metal may be poured over the mixed agents contained in a ladle. Base iron sulphur, according to examples given, is 0.037 per cent or less.

Shell Aids Surface Finish

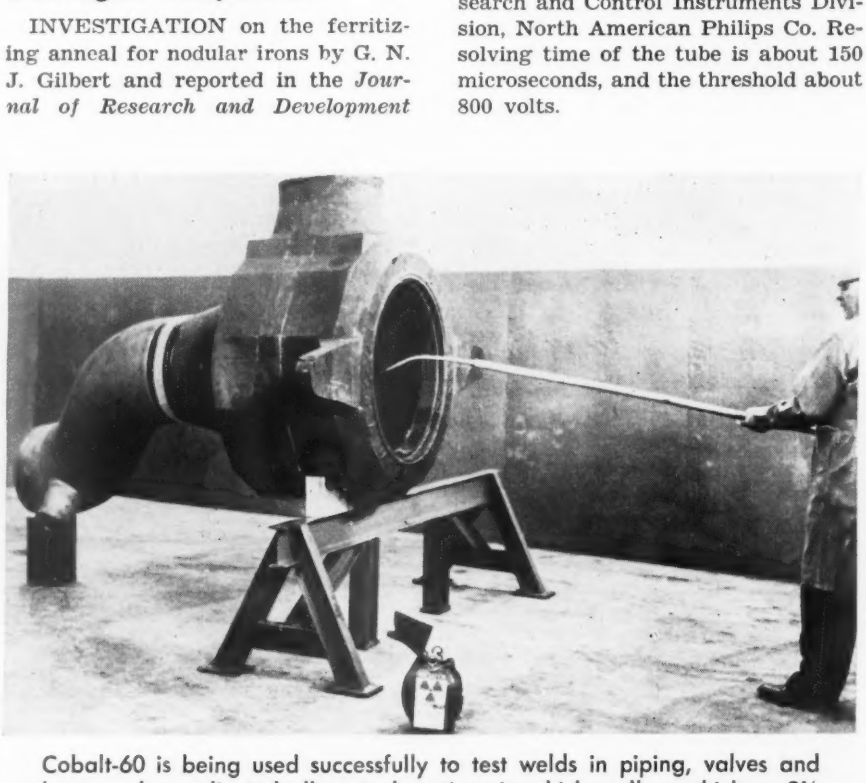
ONE of the largest castings being made in a shell mold is a 420-pound guide shoe used on seamless tube mills. Made of alloy steel, the casting measures 16 in. wide, 9 in. high and 32 in. long. Top of the piece is concave. The shoes are mounted end to end on the mill and provide a cradle for the revolving billet as it is being pierced. The shell-cast concave top has a smooth surface that does not require grinding. Wear resistance of this surface is said to be improved because the outer skin of metal is not removed. The shoes are being cast by General Alloy Castings Co., Rochester, Pa. Molds are made on a Shalco 24 x 36-in. shell molding machine, and the drag is imbedded in sand when the mold is poured.

Use Higher Temperature

INVESTIGATION on the ferritizing anneal for nodular irons by G. N. J. Gilbert and reported in the *Journal of Research and Development* (Birmingham, England) for August, led to the conclusion that they should not be heat treated to the ferritic condition by simply holding them at a subcritical temperature such as 690°C (1274°F). Such treatment produces a sub-boundary structure in the ferritic grains which is associated with embrittlement in the impact test. Irons held above the critical range at 900°C (1652°F) before treatment at 690°C do not have the sub-boundary structures and have normal good impact properties. Satisfactory ferritic structures are obtained whether irons are normalized by air cooling from 900°C to room temperature before heat treatment at 690°C or simply furnace cooled from 900°C to the 690°C annealing temperature.

X-ray Spectrography

NEW Geiger counter tube designed for x-ray spectrographic work involving elements such as phosphorus, silicon and aluminum has been developed, according to *Industrial Research Newsletter,* Armour Research Foundation of Illinois Institute of Technology, Chicago. Producer is Research and Control Instruments Division, North American Philips Co. Resolving time of the tube is about 150 microseconds, and the threshold about 800 volts.



Cobalt-60 is being used successfully to test welds in piping, valves and large and complicated alloy steel castings in which walls as thick as 2½ inches are built up by welding at plant of National Supply Co., Toledo, O.

BASIC NEWS
FOR CUPOLA OPERATORS

Basic Refractories offers field service to foundries

Cupola operators interested in adopting a basic practice can get information and help from Basic Refractories' engineers. These men know refractory application and are familiar with cupola practice.

BASIC SLAG SYSTEMS MAKE POSSIBLE GREATER CARBON PICKUP

A major advantage of basic cupola practice is greater carbon pickup. Carbon in the coke becomes readily available for combustion and absorption by the metal as a result of constant fluxing of coke ash by basic slags. With a given carbon content in the charge—and comparable operating temperatures—carbon pickup of the metal tends to be greater with slags of high basicity.

Another controlling factor of carbon pickup in the basic cupola is temperature. Higher operating temperatures generally result in greater carbon pickup.

Carbon pickup favored by highly reducing conditions

Carbon pickup and desulphurization are closely related in basic cupola practice. And both carbon pickup and sulphur reduction are favored by highly reducing conditions. Basic cupola slags which show a slight oxidizing condition limit carbon pickup and retard desulphurization.

VARIABLES AFFECTING CARBON PICKUP

If carbon analysis of the metal varies, it may be the result of one of the following:

1. Variation in coke ratio, which affects operating temperature,
2. Variation in height of coke bed,
3. Variation in carbon analysis of steel scrap charged.

Variation in coke ratio can occur from day to day without the operator's knowledge if moisture comes in contact with the coke. There have been cases where coke absorbed 15 per cent or more water by weight. If charges are made by weight, this change due to moisture content will affect operating temperature.

A variation in coke bed height can also affect temperature. This height should be maintained by keeping a proper balance between coke charged and melting rate.

With a basic slag system, large amounts of steel scrap are generally substituted for pig iron. Carbon content of this scrap may vary greatly.

Basic linings for cupolas offer 8 advantages

Costs of basic linings and maintenance refractories are higher than those of acid materials. But these costs are offset by the following advantages:

1. **Lower sulphur content in the iron produced.**
2. **Greater carbon pickup.**
3. **Higher metal tap temperatures.**
4. **Use of lower cost charges.**
5. **Absence of bridging and clean drop.**
6. **Better pouring characteristics of metal.**
7. **Less scrap castings.**
8. **Steel scrap can be substituted for low phosphorous pig iron without lowering the total carbon content of the iron.**

View from cupola bottom shows inside cleaned before installing monolithic lining

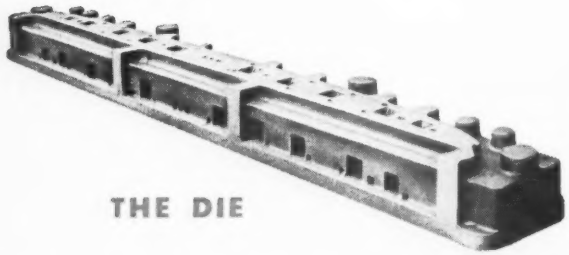
This view of the cupola illustrates the interior with Gundol lining in place

BASIC REFRACTORIES INCORPORATED

845 HANNA BUILDING • CLEVELAND 15, OHIO

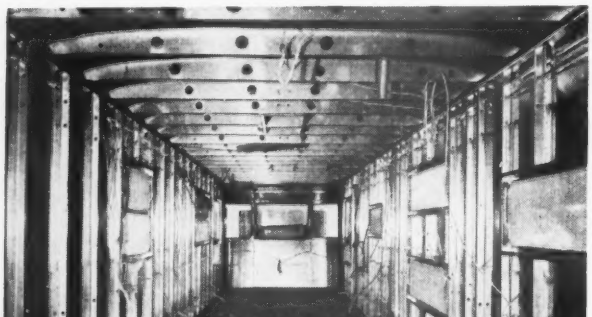
REFRACTORIES ENGINEERING AND SUPPLIES, LTD.—EXCLUSIVE CANADIAN AGENTS

AT NEMCO FOUNDRY: ANOTHER PROBLEM SOLVED BY CITIES SERVICE CORE OIL



THE DIE

The die pictured here was cast at Nemco Foundry for use by the Spartan Aircraft Company in producing roof ribs for its Spartan Mobile Home. Difficult to produce, it required 10 cores 2⅝" x 2⅝" square and 25 cores, quarter-circle in shape, from ¾" to 1" in diameter. Semi-circular shape was necessary to core curved slots from top of die to sides. Holes had to be clean and free from obstruction, allowing stamped slugs to fall through. Nemco relied on Cities Service Delco Core Oil to help meet exact specifications. "A smart choice," says J. A. Dean, General Manager. "Delco Core Oil made the job far easier."



THE ROOF RIBS

The roof ribs of this Spartan trailer, cast from the die produced at Nemco, are visual proof of a job well done. "The great strength and high collapsibility of Cities Service Delco Core Oil share a lot of the credit," says Nemco.

THE FINISHED PRODUCT

The finished product is this handsome Spartan Mobile Home awaiting shipment to consumer. Spartan's rigid specifications help make it one of the safest and best on the market.

Difficult casting of die to form roof ribs for Spartan Mobile Home made easier by Cities Service Delco #36

Located in Tulsa, Oklahoma, Nemco Foundry enjoys attacking the really tough jobs and making them easier. And often helping to spearhead the attack is Cities Service, as described here by J. A. Dean, General Manager:

"Recently Cities Service Delco #36 Core Oil again solved a tough job for us in fulfilling the requirements for a casting for the Spartan Aircraft Company, makers of Spartan Mobile Homes. The casting was a bottom shoe for blanking die to make roof ribs for the all-aluminum shells for Spartan trailers.

"The die was of Nemcoloy, Type AL, an alloyed grey iron. It was 106" long, 8" thick and 13½" wide, and weighed 2,018 lbs. cleaned.

"It required 10 cores 2⅝" x 2⅝" square. In addition, it demanded 25 cores, quarter-circle in shape, ranging from ¾" to 1" in diameter. Semi-circular design was necessary in order to core curved slots from the top of the die to the sides of the die. Holes had to be clean and free of obstructions allowing the stamped slugs to fall through the die to the outside and not hang up.

"Cities Service Delco #36 Core Oil enabled us to meet these requirements perfectly. We certainly recommend it where great strength and high collapsibility are needed."

Like Nemco, scores of other foundries have reported unusual results with problem-solving Cities Service Core Oils. Nor does the praise end with the product . . . for time and again the solution for the proper core oil has resulted from the knowledge, understanding and experience of a Cities Service Lubrication Engineer. If you have a lubrication problem, why not talk it over with one of these Cities Service experts? Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Around the Country

NEWS REPORTS FROM

Cleveland . . . . New York . . . . Los Angeles . . . . Pittsburgh

Detroit . . . . Philadelphia . . . . Chicago

Cleveland— Directors of Northeastern Ohio Chapter of the AFS at their meeting Nov. 10 voted to give approximately $5000 for equipment to furnish the foundry in the new school now under construction by Cleveland Trade School. Actual equipping of the foundry will be some time in the future inasmuch as construction of the new building has just started. The chapter also will present, during March, a television program over a local station. Present plans are that the program will show how a casting is made, including the pouring of an actual part. The foundry program is part of a series of such shows sponsored by the Joint Engineering Societies Council portraying various industries in Cleveland.

Since early in October Ford Cleveland Foundry has been producing resin-bonded shell barrel cores for the Mercury engine. They are being blown on machines adapted for the purpose by Ford engineers. Plans are that the entire run of barrel cores will be made as shells. Expansion of the foundry, previously reported, is still in the paper stage, with construction to begin by spring.

Overall picture of foundry business, as elsewhere, is good. Foundries of all kinds are busy. Some have backlogs of as much as six months. Equipment and supply people are doing as much and more business than ever before. Pattern shops, however, are finding things slow going, having gone through a period of peak activity a short time ago.

New York—Foundry operations will lag in December, due to year-end inventory taking and other seasonal influences. However, business recently has been the best this year. Currently, the ferrous shops are averaging 85 per cent of normal, with the nonferrous shops doing even better at around 90 per cent.

Virtually all foundries are working five days a week and some six days. On the other hand, not all shops are maintaining a five-day schedule with a full working force. Hence, operations have fallen a little short of full normal capacity.

Gray iron shops report demand highly diversified although construction needs still stand out a bit, despite the approach of winter. Order backlogs range three to four weeks. The relatively small steel and malle-

25-lb. plating work carrier cast in high-conductivity beryllium copper and used in plating equipment made by The Udylite Corporation.

WHEN PARTS ARE CAST FOR A TOUGH ROLE THEY'RE MADE OF BERYLCO® BERYLLIUM COPPER

The increased amperage called for in modern plating equipment demands higher conductivity in this casting—a contact which rides on a copper bus bar and transmits current from the bar to the plating tanks. Various materials used in the past, although they had the required wear resistance, lacked the conductivity for this application.

Our engineers recommended that the part be cast in "Berylco." The solution was ideal. "Berylco" not only combines high conductivity with high strength and remarkable wear resistance, but is also a very good casting alloy. Pouring temperatures are low, fluidity is excellent, and needed detail can be sharply reproduced. Most important, cost is competitive.

INTERESTED IN CASTING APPLICATIONS?

We will be glad to assist you with any specific questions you may have on beryllium copper castings. Just drop us a line. If your interest is general, write for your free copy of "Berylco Beryllium Copper Casting Alloys," which packs a wealth of information into four pages.

BERYLCO®

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The

HANNA 38-POUND PIG

The foundryman's favorite standard pig. Available in all grades, silvery and HannaTite. A good example of the quality that has made Hanna "the best known name in iron."

The New

EXCLUSIVE HANNATEN INGOT

For 10-lb.-pig users, this new ingot means no free-carbon pockets, finer grain structure, more even melting. Available in all grades, silvery and HannaTite—an extra-close-grain iron.

THE HANNA FURNACE CORPORATION

Buffalo • Detroit • New York • Philadelphia

Merchant Pig Iron Division of

NATIONAL STEEL CORPORATION

able capacity in this area is being almost fully engaged, with backlogs averaging six to eight weeks. Malleable foundries report a particularly good demand for builders hardware.

Continued strong demand for pumps, meters, valves and plumbing supplies generally is contributing to the brisk activity at the brass and bronze shops. There is some seasonal lag in meters, but so far it has had little affect on foundry operations.

Foundries engaged in maritime work are doing well, mostly on commercial business, as relatively little Navy work is reported in this area. Light metal shops also are active.

Los Angeles—For most foundrymen in this district, 1955 will be about 10 per cent better than last year, with the fourth quarter of each year about equal. Most foundry executives can't come up with a definite reason for the improved business. "About all I can say is that our customers' requirements seem to be up over 1954," one prominent foundry owner said. "We didn't come up with a lot of new accounts in the past year, but our old accounts were much more active than last year."

Failure of the usual seasonal slumps to materialize was given by some foundrymen as the primary cause for the good year. In 1954, many foundries went through the summer months on less than 60 per cent of total capacity. This year almost all steel foundries operated in excess of 90 per cent of capacity.

For 1956, foundrymen anticipate an active first quarter. Inquiries during the fourth quarter will be about 10 per cent more numerous than usual, foreshadowing continued good business in the immediate months ahead. Backlogs of most foundries stretch to six weeks, extending as far as eight or ten weeks on special jobs.

Foundry purchases of No. 1 cupola cast have lessened somewhat, although for several months the foundry was the average scrap dealers best customer. Prices range from $42 to $44.

Chicago—In October Mayor Richard Daley appointed a 30-man committee to study ways to curtail air pollution here. Named to head the committee was Kenneth V. Zwiener, president, Harris Trust & Savings Bank.

This is not a new subject for the city. For a long time Chicago has had an Air Pollution Control Department and it has a good record for accomplishment. Furthermore, the Chicago Association of Commerce and Industry has had a Cleaner Air Committee which works actively on

new Baker

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saves up to $400 on initial cost

Now you can mechanize your bulk handling operations for less than $10.00 per day for one year . . . much less than you pay a laborer with a hand shovel!

This rugged Model 20 SHOVELOADER has a lifting capacity of 1500 pounds, and lifting height of 7 feet. Standard bucket size is 12 cubic feet. Loader arms are in *front* of operator—not around him—protecting him from injury and providing full 360° visibility at all times.

Four forward speeds with top travel speed of 14 MPH make this a *fast* machine and insure better operation on ramps and rough ground conditions.

Bucket tilt-back at ground level means a full load at every grab, and permits low carrying position for travel. Other advantages are longer forward reach, greater longitudinal stability, extremely low maintenance because of easy accessibility of all parts requiring service, and design of the husky, trial-proven engine.

Special attachments are available for special jobs—forks for palletized loads, crane hooks for hoisting, and special buckets for dense materials. Catalytic exhaust system is available for inside work, where required.

Compare these and SHOVELOADER's many other features with loaders costing $350 to $400 more! Write for complete information. The Baker-Raulang Company, 1223 W. 80th St., Cleveland 2, Ohio.

Baker
HANDLING EQUIPMENT

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JUST TO SET THE RECORD STRAIGHT!

Here are a few **FACTS** *about pins and bushings*

1 Over 30 years ago, HINES *designed* and *produced* the *first* hard-chrome-plated and ground pins, and case-hardened, hard-chrome-plated and ground bushings.

2 Today, HINES is still the *only* producer of hard-chrome-plated pins and bushings.

3 Hard-chrome-plating of pins and bushings is the *only* successful way to prevent rust and "chattering", and insure a smooth, quick draw.

4 Perfect alignment of cope and drag is achieved *solely* by accurate machining of the flask *prior* to installation of pins and bushings. HINES flasks are machined for pins and bushings in a micrometer-adjusted jig, to guarantee perfect alignment of cope and drag.

5 HINES flasks can be equipped to your *exact* requirements, with single or double pins—round, hex or "V" type— with adjustable slides or bushings.

6 The best proof of the quality and efficiency of HINES pins and bushings, is the indisputable fact that more foundries use HINES than any other brand.

7 HINES, and only HINES, is the producer of HINES pins and bushings.

8 There's never been a satisfactory substitute for the best equipment!

THE HINES FLASK CO.

3431 WEST 140th STREET
CLEVELAND 11, OHIO

the problem. Industry has a good record for co-operating with these agencies.

What prompted Mayor Daley to appoint the new committee is the fact that the United States Surgeon General has been granted a $5 million appropriation for study of city smoke and pollution abatement, and Chicago is entitled to a share of these funds.

The technical aspects of the study will be under the direction of Dr. H. A. Leedy, director and vice president of Armour Research Foundation of Illinois Institute of Technology.

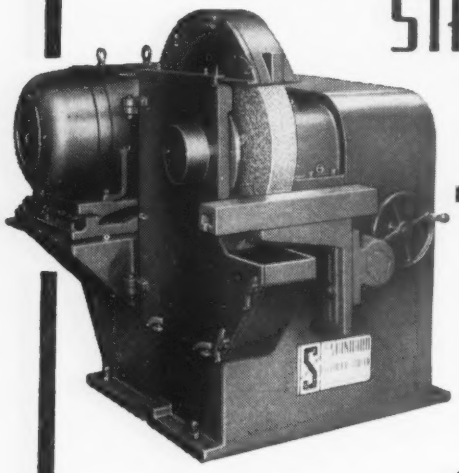
Ever since smoke abatement was initiated, foundries have been targets of inspectors and drafters of city ordinances. Some of the prohibitions have been severe and this has resulted in organizations like the American Foundrymen's Society and Gray Iron Founders undertaking studies of their own and drafting recommendations for suppressing smoke and dust. Although undertaken as self-protection, these programs have been effective and have headed off or moderated oppressive regulations by municipalities.

51% SAVINGS IN WHEEL COSTS!

(says a Midwestern foundry)

. . . SINCE WE INSTALLED

STANDARD INFINITELY VARIABLE SPEED SNAGGING GRINDERS



Wheel Cost Per Ton of Castings Ground:

Before . . . $4.86

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SAVINGS . $2.48

ON EVERY TON OF CASTINGS GROUND!

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Single and Twin Wheel Grinders 5 hp, 20" to 100 hp, 30" Wheels

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Write for Catalog and Complete Details

Detroit— Chrysler Corp. is re-equipping, completely, its permanent mold foundry in Detroit for production of automotive pistons. It will be in partial production by January, and when finished, will produce 75 per cent of Chrysler's piston requirements.

The foundry covers an area of about 25,000 sq ft and will contain 16 automatic permanent mold machines and eight dry hearth combination melting and holding furnaces. Production is expected to reach 48,000 pistons per day on a three-shift, around-the-clock operation.

Much broader in scope is Chrysler's plan to spend more than $1 billion in the next 5 yr to expand its plants and research facilities. Included in the program is the expansion and modernization of plants making engines, transmissions and other automotive components. Some of the money will be devoted to widening research in developing gas turbine and other experimental automotive engines, in the field of nuclear energy, in electronics as it applies to vehicles, and in applications of solar energy.

Another expansion program has been started by Misco Precision Casting Co., Whitehall, Mich., with its recent purchase of a building in Muskegon for housing a foundry to employ about 1200.

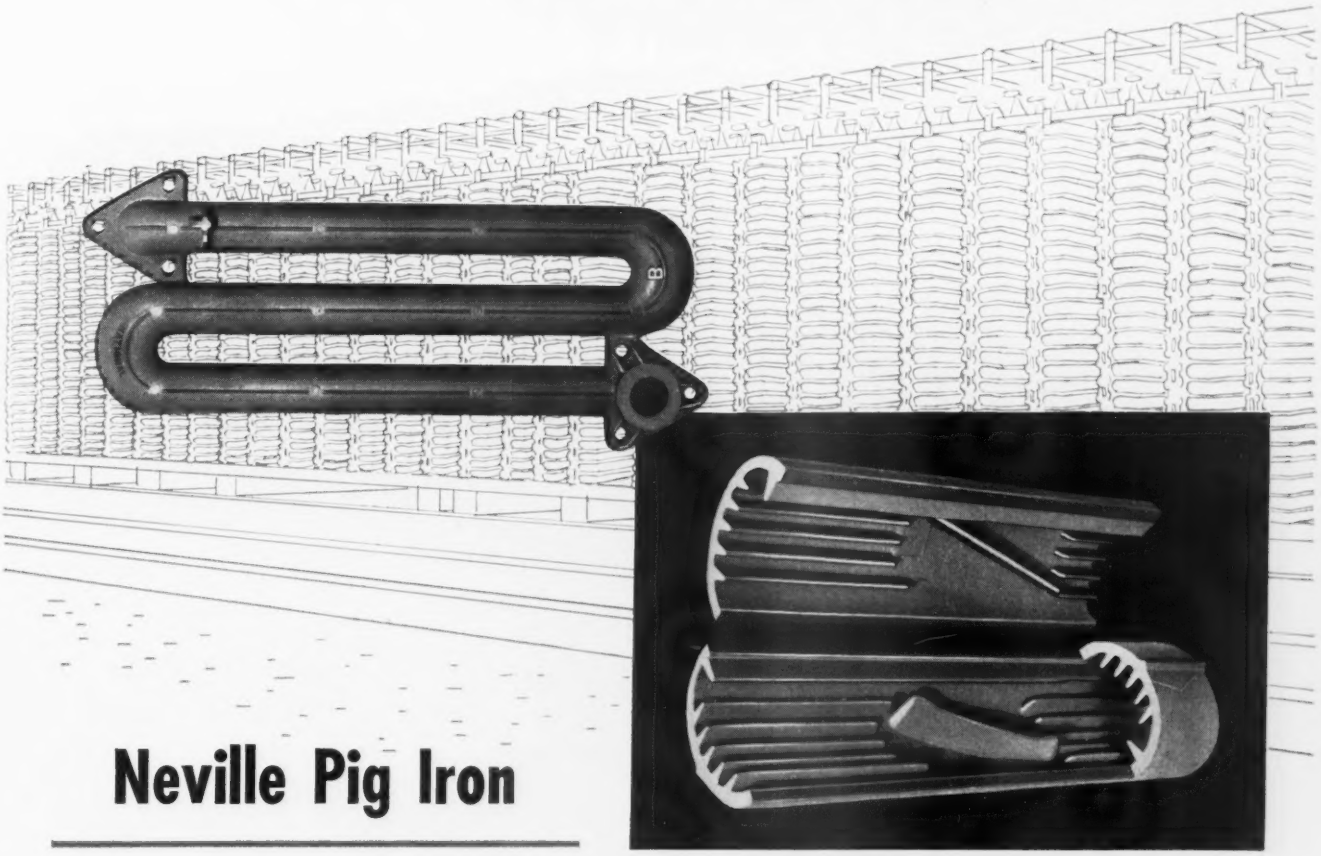
Buick Motor Division of General Motors Corp., Flint, has followed its installation of six new cupolas with additional molding and coremaking equipment and a new setup in the knockout and cleaning room. Also sand preparation facilities will be enlarged.

A new car will appear on the market, probably with the 1958 models, when Ford Motor Co. introduces a fifth line to fit between the Mercury and Lincoln. The gap between these two was widened this year with elimination of the Lincoln Cosmopolitan. The previously higher priced Capri now is surpassed by the Premier. On top of all, of course, is the Continental, just recently introduced.

Philadelphia— Most foundries this fall are experiencing the best business for the year to date. A seasonal letup is expected in December, but most shops have fairly good backlogs and anticipate a pickup in demand after the turn of the year. Gray iron operations are still hovering around 85 per cent of a capacity based on a five-day week with full working forces. Malleable and steel foundries

These National Cast Cooling Sections

have to take it!

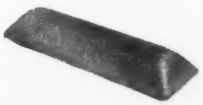


Neville Pig Iron

provides the uniform quality and close grain they need

CAST cooling and condensing sections made by The National-U.S. Radiator Corp., Johnstown, Pa., face some of the toughest service conditions in industry. In chemical plants, petroleum refineries and similar plants, the sections are in constant contact with corrosive materials such as salt water and concentrated sulfuric acid. To withstand these conditions National sections must be cast from gray iron of exceptionally high quality and close grain. And to achieve accuracy in the internal fin design shown above, the gray iron must provide excellent fluidity in casting. To meet these rigid requirements, National Radiator specifies Neville Pig Iron for its cast section production.

W&D 4953 B



Neville Pig Iron and Neville Coke for the Foundry Trade

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at minimum cost . . .

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Cleaning welded section of steam generation plant condenser prior to painting

If you're blast cleaning large areas prior to painting — or cleaning small openings — there's a NORBIDE Pressure Blast Nozzle to give you maximum blast cleaning efficiency at minimum cost.

These rugged nozzles — lined with NORBIDE Boron Carbide, the hardest manufactured material commercially available — maintain stream contour and last hundreds of hours longer than any other nozzle made, eliminating expensive nozzle changing. Available with bores ranging from 1/8" to 7/8" with either flanged or threaded fittings.

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NORBIDE®. . . *The Longest Nozzle Life you can buy*

appear to be doing even a little better, and nonferrous foundries, it is estimated, are at 90 to 95 per cent of normal capacity.

Construction requirements for gray iron are not quite what they were, but they are still good; general machinery needs are active, and quite a little work still is coming from utilities. However, the present high level of business can best be ascribed to a diversity of work rather than to any special activity in relatively few lines. Most gray iron shops are quoting around five weeks' delivery.

Steel castings are in brisk demand for construction and mining equipment, industrial trucks, conveyor equipment and a diversity of other requirements. Delivery promises usually are seven to eight weeks.

Railroad requirements are stimulating the malleable market, and will likely be a greater factor in the first half of next year, judging by the heavy amount of railroad equipment inquiry being figured. Meanwhile, business continues brisk in pipe fittings, hardware and heavy truck components. Malleable shops are running five to six days a week, with delivery promises ranging six to seven weeks.

Brass and bronze shops are booked ahead about six weeks on an average, with demand coming out from a variety of sources. Buying of aluminum castings is well sustained at the rate of the past several months. Aircraft requirements are still outstanding.

Pittsburgh—Heavy equipment builders are accumulating large backlogs, and their demand for castings should remain strong in the first half of 1956, judging by recently-announced steel expansion plans. Mesta Machine Co. had a backlog of about $30 million in orders at the beginning of this year. Now Mesta's backlog is over $60 million.

Another equipment builder reports castings weighing 300 to 400 pounds require eight to ten weeks for delivery, compared with delivery in four to six weeks a year ago, showing the effects of increased demand in this area. Steel and iron foundrymen agree that heavy demand from most customers should continue well into next year.

Spokesmen of United Engineering & Foundry Co. are again expressing hope that they may be able to buy the government-owned foundry at New Castle, Pa., which United operated under lease until last March. An earlier bid by United to purchase the plant was rejected last summer as "too low."

ACCO Registered* Slings

Photo courtesy Allis-Chalmers

It happens every day

• Maybe you have dropped a load in your shop. The damages, and loss of production, came to a pretty penny. But you can guard against such accidents by calling your nearby ACCO *Registered* Sling distributor.

From him you can get a variety of sling chains to the length you need, with your choice of sling, grab, or foundry hooks and fittings that will fit the sling exactly to your work. For instance, you can get ACCOLOY sling chains in sizes from ¼" to 1¼" that have four-leg working load limits from 9,500 lbs. to 199,000 lbs. at a 60° angle. These limits are not theoretical. They are based on actual proof-testing of each completed ACCO *Registered* Sling Chain to insure safe operation.

Don't wait until you have an accident. Check today with your ACCO *Registered* Sling distributor or write our nearest district office for further information.

WHAT "ACCO REGISTERED" MEANS...

1 The best material
2 Unit safety factor (on bodies, rings, links, hooks)
3 Proof test of complete sling to twice the working load limit
4 Actual field service test of each design
5 Metal identification ring on each sling
6 Signed Registry Certificate with each sling

*Trade Mark Registered

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TRADE MARK

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the lightest, most in its class, on the

CLECO'S NEW 2000 Series Grinder

WITH THE LIGHTWEIGHT, HI-STRENGTH HOUSING

Now, a 6-inch pneumatic grinder by Cleco that offers *more* power, safety, versatility, and dependability than any other grinder in its class on the market today.

Let us demonstrate these outstanding features in your plant:

GREATER POWER—A demonstration on your air lines will prove the extra power of the Cleco 2000.

LIGHTER—Weighs only 10½ pounds (without guard); over-all height, 7⅝"; lightweight design embodies hi-strength magnesium housing.

MAXIMUM OPERATOR SEE-ABILITY—Standard revolving safety guard for flanged cup wheels or optional cut-away wheel guard, which gives operator full view of work at all times.

EASIER, SAFER OPERATION—Sensitive snap handle gives operator instantaneous throttle control *while he maintains a full grip.*

MORE COMFORTABLE OPERATION—Three-position dead handle adjusts to suit the operator. Muffling device at air discharge reduces noise.

MORE VERSATILE—Throttle valve can be changed from snap handle to wing nut without changing handle. Speed settings available at either 4,500 rpm or 6,000 rpm.

LONGER LASTING—New built-in oil-mist lubricator injects a fine oil spray *while the motor runs.* Graphite-impregnated rotor blades, specially designed governor bearings, and a ball-type inlet valve extend the Cleco 2000's service-free life.

MORE DEPENDABLE—Factory-locked governor prevents tinkering or faulty setting by the operator, yet is easily adjusted by your repair shop without time-consuming disassembly and reassembly between tachometer tests.

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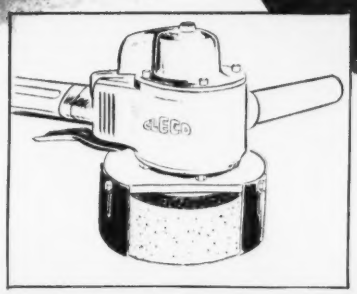
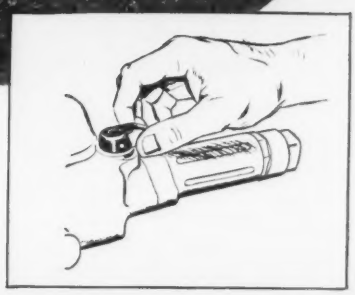
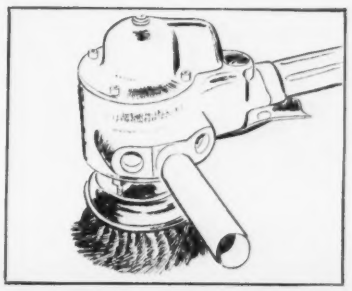


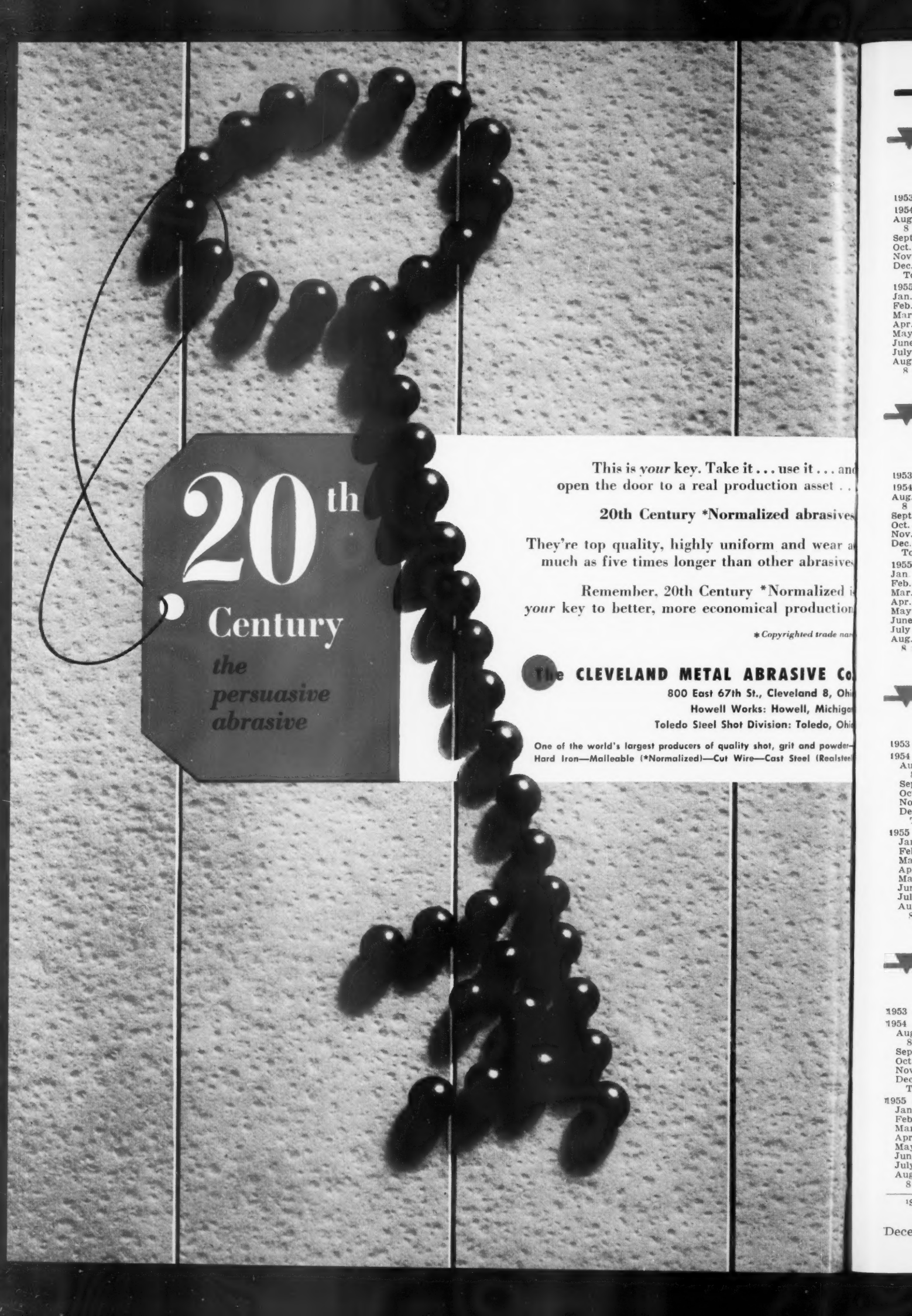
OPTIONAL CUT-AWAY WHEEL GUARD



OPTIONAL WING NUT THROTTLE VALVE



WIRE BRUSH ATTACHMENT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Hard Iron—Malleable (*Normalized)—Cut Wire—Cast Steel (Realsteel

Foundry Statistics

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Unfilled Orders[3]
	Total	For Sale	
1953	970,506	578,749	.....
1954			
Aug.	59,259	34,528	62,494
8 mo.	549,051	300,483	.....
Sept.	58,015	33,929	66,742
Oct.	64,321	36,956	71,090
Nov.	70,030	41,609	80,686
Dec.	80,599	49,005	85,064
Total	812,016	461,982	.....
1955			
Jan.	82,028	48,000	99,817
Feb.	85,979	48,721	101,766
Mar.	102,364	60,063	99,730
Apr.	101,226	57,397	104,091
May	98,397	57,317	106,446
June	99,456	60,261	107,559
July	75,570	44,914	115,420
Aug.	82,448	48,126	123,473
8 mo.	727,468	424,799	.....

ALUMINUM

(Shipments of castings—1000 pounds)

	Shipments				Unfilled Orders[3]
	Total	Sand	Perm. Mold	Die	
1953	658,022	214,553	200,025	239,330	.....
1954					
Aug.	43,522	11,642	15,415	15,835	77,304
8 mo.	402,115	107,914	131,014	155,546	.....
Sept.	47,844	11,107	16,731	19,344	80,294
Oct.	54,903	12,765	19,238	22,247	88,518
Nov.	56,066	12,934	20,396	22,137	94,491
Dec.	64,045	13,753	23,629	26,017	99,556
Total	624,973	158,473	214,408	245,291	.....
1955					
Jan.	64,414	13,358	23,679	26,819	102,382
Feb.	66,869	13,579	24,319	28,234	108,939
Mar.	78,958	16,019	29,029	33,229	110,046
Apr.	73,049	14,041	28,028	30,208	109,156
May	71,691	14,235	25,597	31,243	104,984
June	68,473	14,920	24,682	27,939	102,799
July	55,033	11,716	21,006	21,656	101,024
Aug.	64,763	14,916	22,267	27,004	105,994
8 mo.	543,250	112,784	198,607	226,332	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1953	990,496	888,369	61,316	.....
1954				
Aug.	69,091	63,589	3,547	29,052
8 mo.	554,726	498,728	33,157	.....
Sept.	68,487	62,372	3,637	31,232
Oct.	70,276	63,855	3,619	30,396
Nov.	70,020	63,065	4,089	27,608
Dec.	72,421	65,159	4,346	32,054
Total	835,930	753,179	48,848	.....
1955				
Jan.	72,233	64,540	4,678	30,864
Feb.	75,253	67,768	4,598	37,520
Mar.	92,149	83,149	5,649	42,940
Apr.	84,183	75,903	5,152	51,111
May	85,008	76,064	5,513	49,198
June	90,476	80,869	5,840	45,820
July	65,816	59,138	3,998	48,085
Aug.	86,300	77,721	5,322	47,486
8 mo.	651,418	585,152	59,910	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1953	34,517	31,469	.....
1954			
Aug.	2,190	1,977	7,821
8 mo.	17,142	15,246	.....
Sept.	2,095	1,891	7,499
Oct.	2,092	1,876	7,294
Nov.	2,161	1,906	6,867
Dec.	2,287	1,906	6,678
Total	25,777	22,950	.....
1955			
Jan.	2,305	2,067	7,236
Feb.	2,160	2,009	7,376
Mar.	2,572	2,311	7,011
Apr.	2,633	2,405	6,800
May	2,399	2,174	6,530
June	2,367	2,098	6,346
July	1,920	1,763	5,912
Aug.	2,176	1,192	5,964
8 mo.	18,532	16,019	.....

PRODUCTION WORKERS

Estimated Number
(Thousands)

	July 1955	June 1955	July 1954
Ferrous	210,900	210,900	181,000
Nonferrous	68,800	71,200	57,900

Average Weekly Earnings

Gray Iron	83.62	82.74	72.73
Malleable Iron	80.60	85.20	69.55
Steel	84.86	87.57	75.04
Nonferrous	82.81	84.03	77.79

Average Weekly Hours

Gray Iron	41.6	42.0	39.1
Malleable Iron	40.5	42.6	36.8
Steel	40.8	41.7	37.9
Nonferrous	40.2	40.4	38.7

Labor Turnover Rate (July)
(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	4.0	5.0	2.5	1.8
Malleable Iron	3.0	2.5	1.8	0.1
Steel	3.6	2.9	1.5	0.7
Nonferrous	3.0	3.7	1.8	1.4

Source: Bureau of Labor Statistics

GRAY IRON CASTINGS—SHIPMENTS (Net Tons[1])

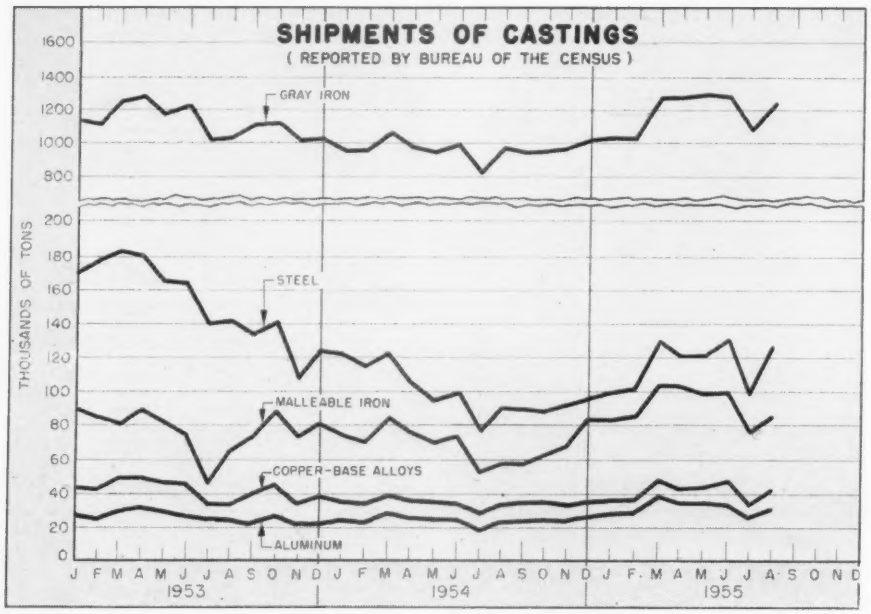
	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[3]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	Total[3]	Total[3]	
1953	13,707,902	7,494,843	8,449,837	3,675,454	2,829,159	1,389,483	467,142	1,285,598	677,166	.....
1954										
Aug.	934,644	541,904	569,790	250,702	140,165	69,897	29,134	127,255	68,300	829,505
8 mo.	7,596,430	4,125,912	4,857,903	2,027,982	1,126,637	513,016	233,934	891,962	523,007	.....
Sept.	921,232	533,909	559,934	248,124	139,679	68,053	25,374	124,821	71,424	810,654
Oct.	942,934	552,022	570,365	253,802	150,282	79,191	23,599	130,326	68,362	789,117
Nov.	997,301	547,447	623,390	258,933	167,983	85,703	25,723	118,480	61,725	759,613
Dec.	1,074,258	563,699	680,700	276,045	200,044	97,936	27,229	111,082	55,203	744,633
Total	11,532,158	6,322,989	7,292,292	3,064,886	1,784,625	843,899	325,859	1,376,671	743,721	.....
1955										
Jan.	1,091,923	563,153	712,097	282,386	192,132	97,007	25,783	100,638	61,273	782,656
Feb.	1,106,165	578,171	720,304	291,675	196,118	99,794	27,401	95,285	67,057	852,168
Mar.	1,314,918	688,733	847,874	334,287	217,571	109,681	36,732	129,746	82,995	934,224
Apr.	1,293,678	679,867	819,872	319,149	216,116	108,490	35,415	145,871	76,404	966,057
May	1,310,424	707,105	803,897	315,072	227,236	117,915	35,966	168,772	74,553	937,949
June	1,296,196	715,862	793,067	327,520	228,044	117,727	43,807	147,351	83,927	981,918
July	1,069,711	579,122	634,869	246,297	210,130	112,137	28,181	129,191	67,340	1,049,565
Aug.	1,226,312	688,317	718,423	301,502	238,007	121,071	29,298	156,074	84,510	1,160,466
8 mo.	9,709,327	5,200,330	6,050,403	2,417,888	1,725,354	883,822	262,583	1,072,928	598,102	.....

STEEL CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[3]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1953	1,834,197	1,400,013	321,010	1,276,729	959,493	293,491	557,468	417,148	27,519	.....
1954										
Aug.	89,590	66,792	9,844	61,344	44,236	8,148	28,256	22,556	1,196	168,303
8 mo	827,446	616,777	98,602	568,053	413,150	87,930	259,403	204,371	10,990	.....
Sept.	88,359	64,722	8,668	59,039	41,735	7,690	29,320	22,987	978	158,823
Oct.	87,085	64,004	8,580	56,705	39,872	7,596	30,380	24,132	984	154,079
Nov.	87,659	64,812	7,742	56,057	40,085	6,624	31,602	24,727	1,118	175,715
Dec.	93,547	69,843	12,489	62,967	45,632	10,469	30,841	24,211	1,245	179,148
Total	1,184,096	880,158	135,581	802,321	580,474	120,309	381,285	303,428	15,315	.....
1955										
Jan.	98,238	75,044	13,809	67,307	49,816	12,762	30,841	25,228	1,047	201,839
Feb.	106,430	80,729	16,501	74,709	55,014	15,381	38,945	25,715	1,120	202,301
Mar.	127,460	98,926	19,339	88,867	68,013	17,887	34,933	30,913	1,452	215,059
Apr.	120,053	92,237	16,646	84,247	63,244	15,163	35,806	28,993	1,483	221,336
May	122,465	92,713	16,810	85,950	63,182	15,335	36,515	29,531	1,475	225,302
June	133,887	102,457	19,591	93,417	69,986	17,979	40,470	32,471	1,612	251,416
July	97,875	71,170	11,631	68,094	48,140	10,666	29,781	23,030	965	354,628
Aug.	126,406	96,290	20,576	91,245	68,514	19,094	35,161	27,776	1,482	413,531
8 mo.	932,814	709,566	134,903	653,836	485,909	124,267	282,452	223,657	10,636	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.

FOUNDRY STATISTICS



COMMERCIAL HEAT TREATING

(National Billings of Metal Institute Members)

	1953		1954		1955	
	No. Reporting	Total Reported	No. Reporting	Total Reported	No. Reporting	Total Reported
June	51	$2,591,154	61	$1,996,770	62	$2,488,800
July	58	2,522,651	61	1,722,499	63	2,035,100
Aug.	60	2,452,186	62	1,801,659	64	2,439,300
Sept.	57	2,522,127	63	1,853,665	63	2,581,000
9 mo.		24,264,945		18,261,734		21,219,880
Annual total		31,733,067		24,244,368		.....

COKE PRODUCTION AND CONSUMPTION

(Net tons)

	Production	Consumption Total	Consumption By Foundries
1953	78,467,806	78,227,414	2,915,420
1954			
July	4,618,665	4,555,701	170,617
7 mo.	34,602,342	34,203,753	1,446,062
Aug.	4,510,603	4,501,477	195,344
Sept.	4,490,603	4,434,650	191,607
Oct.	5,082,374	5,100,135	208,418
Nov.	5,230,237	5,283,916	221,391
Dec.	5,610,564	5,615,228	217,104
Total	59,526,723	59,139,159	2,479,926
1955			
Jan.	5,805,926	5,862,113	234,784
Feb.	5,394,166	5,519,241	242,282
Mar.	6,235,909	6,306,723	286,072
Apr.	6,135,645	6,164,459	278,242
May	6,426,747	6,570,567	277,967
June	6,148,026	6,297,338	249,525
July	6,169,770	6,266,631	221,372
7 mo.	42,316,189	42,987,072	1,790,244

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1954	1955
Jan.	20,661	25,201
Feb.	19,920	25,349
Mar.	23,653	29,713
Apr.	24,746	27,641
May	22,269	23,708
June	22,348	23,141
July	17,074	18,513
Aug.	21,684	27,013
Sept.	22,464	26,349
Oct.	24,080	....
Nov.	23,061	....
Dec.	21,273	....
Total for year	263,233	....

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1953	521,253	349,022	.....
1954			
Aug.	38,093	24,897	46,288
8 mo.	332,926	199,473	.....
Sept.	38,973	25,617	56,206
Oct.	42,202	27,337	64,700
Nov.	51,990	35,207	62,950
Dec.	54,410	35,211	69,603
Total	520,501	322,845	.....
1955			
Jan.	58,586	35,472	70,691
Feb.	58,585	35,893	73,858
Mar.	71,811	44,048	81,363
Apr.	71,595	45,477	81,756
May	63,735	38,124	74,472
June	66,569	42,753	71,344
July	47,928	27,429	68,927
Aug.	62,677	61,957	75,592
8 mo.	501,486	331,153	.....

INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1954	1955
Jan.	173.8	81.0
Feb.	99.9	90.4
Mar.	82.7	163.6
Apr.	125.3	178.6
May	80.8	145.7
June	86.4	186.8
July	68.8	213.4
Aug.	75.6	134.0
Sept.	68.3	....
Oct.	147.5	....
Nov.	61.4	....
Dec.	113.9	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent (monthly average). This is a new base period. Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	By Types of Furnace: Cupola Total	Air Total	Electric Total
1953	69,005,976	9,676,463	1,026,334	8,263,880
1954				
July	3,909,336	565,275	45,920	420,564
7 mo.	31,530,659	4,949,509	488,579	3,445,546
Aug.	4,164,703	671,631	65,336	486,596
Sept.	4,298,495	675,593	68,860	500,349
Oct.	4,782,488	710,127	67,678	528,432
Nov.	4,928,850	737,286	71,844	573,298
Dec.	5,075,563	798,435	82,910	566,223
Total	54,780,758	8,542,581	855,207	6,100,444
1955				
Jan.	5,416,052	813,682	90,622	614,824
Feb.	5,350,452	823,465	91,916	577,296
Mar.	6,313,717	993,266	113,198	727,401
Apr.	6,239,036	975,751	108,965	726,138
May	6,415,947	963,082	109,074	745,060
June	6,117,573	928,908	116,419	733,573
July	5,447,130	730,735	81,216	623,623
7 mo.	41,299,907	6,228,889	711,410	4,747,915

PIG IRON PRODUCTION AND CONSUMPTION

	Production** (standard grades—net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace—gross tons) Total	Cupola	Air	Electric
1953	74,879,511	2,599,307	3,736,431	60,465,016	8,347,825	66,637,364	4,918,480	272,311	164,267
1954									
Sept.	4,417,888	188,599	179,629	3,622,799	426,861	4,005,578	346,698	16,984	11,654
8 mo.	42,445,322	1,596,658	2,027,096	34,761,585	4,059,983	38,112,356	3,218,103	162,965	114,162
Oct.	4,937,436	212,237	248,643	3,979,437	497,119	4,518,770	367,063	16,186	11,307
Nov.	5,204,446	202,824	263,484	4,233,253	504,885	4,764,215	375,526	16,178	15,932
Dec.	5,526,720	229,717	259,423	4,510,772	526,808	4,978,200	403,726	19,829	13,917
Total	58,113,924	2,241,436	2,798,646	47,485,047	5,587,465	52,373,541	4,364,418	215,158	155,258
1955									
Jan.	5,729,404	243,608	272,451	4,703,875	509,470	5,202,360	409,281	18,874	20,016
Feb.	5,394,585	209,852	252,860	4,425,080	506,793	4,964,515	409,141	20,576	22,551
Mar.	6,406,902	221,437	359,413	5,239,116	586,936	5,830,943	480,639	24,066	15,931
Apr.	6,329,927	210,085	305,188	5,068,506	746,148	5,725,258	467,709	21,536	12,857
May	6,753,236	246,661	342,544	5,385,299	788,732	6,044,882	471,657	21,448	20,085
June	6,494,838	238,412	347,631	5,245,861	662,934	5,774,896	454,751	22,871	21,697
July	6,329,393	233,235	344,365	5,116,960	634,833	5,430,550	361,171	16,483	19,535
Aug.	6,653,578	252,630	343,919	5,397,134	659,895	.....	.....	.....	.....
8 mo.	56,621,443	2,107,379	2,888,322	45,796,732	5,829,010	.....	.....	.....	.....

*Source: U. S. Dept. of Interior. Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

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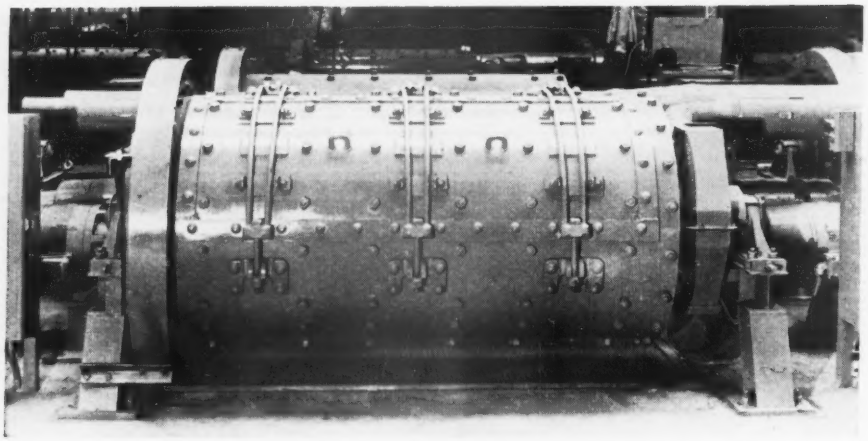
New Equipment and Supplies



Tumbling Mills: W. W. Sly Mfg. Co., 4700 Train Ave., Cleveland 1, O.—A specially designed sound-deadener of ¾-in.-thick neoprene rubber fastened to the inside of tumbler shell is said to make tumbling mill about 90 per cent quieter than the conventional mill. Drive noise has been substantially reduced by the use of precision machined gears and pinions. Field installation can be made by the user's own maintenance crew. Mills are available in diameters from 24 to 48 in. and in capacities from 9 to 92 cu ft. Provisions have been made for effective removal of dust during the operation. Air is admitted through a perforated head at the motor end. Air passes out through slots in the tail trunnion to a dustless housing where it is picked up by a filter system.

For More Details Circle No. 1—Page 197

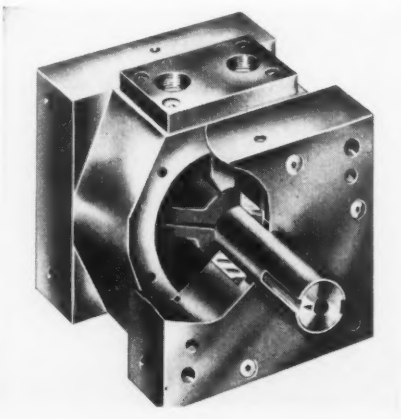
Magnetic Separator: Stearns Magnetic Inc., Milwaukee 46, Wis.—Cross-belt magnetic separator removes tramp iron and automatically discharges it away from the flow of material in a continuous operation. Suspended above a conveyor belt, chute or sorting table, the Alnico permanent magnetic components create a magnetic field that pulls tramp iron out of the material flow. Unit is supplied assembled, including integrally mounted motor-reducer drive.

For More Details Circle No. 2—Page 197

Plastic Aluminum: Woodhill Chemical Co., 1391 East 33rd St., Cleveland, O.—Atomized aluminum metal combined with a patented vinyl vehicle develops a metal putty that can be applied cold and will adhere to metal, wood, leather and other surfaces. It air dries to a metallic hardness and can be filed, sanded, drilled or tapped. Material reportedly is not affected by oil, water, gasoline or naphtha, will withstand heat up to 600° F, will withstand shock and abrasion and has a minimum amount of shrinkage.

For More Details Circle No. 3—Page 197

Torque Motor: Roto-Motion Motors Inc., 525 South Riverside St., St. Clair, Mich.—Square-shaped, instant oscillating torque motor reportedly is capable of obtaining up to 280 degrees rotation of a shaft for turning, opening, closing, clamping, indexing, feeding, locking, pushing, mixing or moving any type load or mechanism. According to the manufacturer, the torque device eliminates complex linkage, gearing, transmissions, reduction gears, racks and pinions, levers, cylinders, cams, Geneva motions and clutches. Motor is said to operate with equal efficiency on air, oil, water or fire-resistant fluid pressure mediums. Mounting can be made on any six faces of 14 mounting models. Four shaft style models can be supplied.



For More Details Circle No. 4—Page 197

Core Coating: Frederic B. Stevens Inc., Detroit 16, Mich. — Graphite-base core coating is recommended for gray iron, brass, bronze and special alloys wherever a "short" wash is desired. Liquid is said to permit fast dipping since there are no run-downs, tear-drops or build-up. Coating reportedly stays on dipped core areas so that prints and assemblies fit accurately.

For More Details Circle No. 5—Page 197

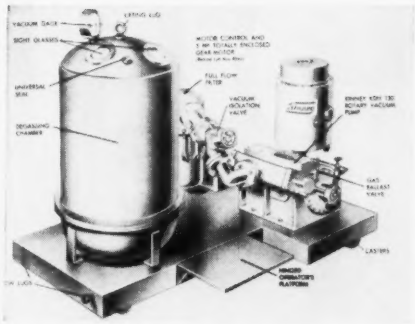
Refractory Gun: National Foundry Sand Co., 2970 West Grand Blvd., Detroit 2, Mich.—Pneumatic gun for application of refractories to

cupolas features an airlock which continuously and automatically takes material from atmospheric pressure and injects it into an air stream where pressure may be controlled from 15 to 85 psi. Metered feed into the material line permits the gun to be used on all types of refractory up to 130 lb per cu ft material. Unit can be powered with any one of several gasoline engines or an electric motor. Standard model will apply 108 to 135 bags of cupola mix per hr of nozzle time.

For More Details Circle No. 6—Page 197

Vacuum Degasser: Kinney Mfg. Division, New York Air Brake Co., 3640 Washington St., Boston, Mass.—Mobile vacuum degassing unit will accommodate up to No. 400 type A or No. 3600 type B crucibles. Mount-

For More Details on These Items
Use Reply Card—Page 197



ed on wheels, the unit is 6 ft square and 5 ft high and consists of a mechanical vacuum pump and gear motor, filter and degassing chamber. Rapid pump down to low pressure is accomplished by a rotary vacuum pump, direct-driven by a 5-hp, 520-rpm, 3-phase, 60-cycle, 220/440-v enclosed gear motor. Through effective degasification, gas in the melt can be reduced to low value, resulting in uniform quality, high-tensile strength castings.

For More Details Circle No. 7—Page 197

Aluminum Alloys: Kaiser Aluminum & Chemical Corp., Kaiser Bldg., 1924 Broadway, Oakland 12, Calif.—Two high-purity grade aluminum alloy ingots, available as standard products, have the same nominal compositions as standard grades but impurities are controlled to much lower levels, according to the manufacturer. This is said to give permanent mold castings a higher reserve of ductility. Castings can be subjected to more nearly complete artificial aging in heat treatment to develop full strength potential and still retain greater elongation.

For More Details Circle No. 8—Page 197

Cut-Off Wheel: Bay State Abrasive Products Co., Westboro, Mass.—Faster cutting speeds and added strength are claimed for cut-off wheels as new bonds and bonding processes permit an increase in abrasive grain content and allow grains to be bonded in a porous construction. Manufacturer recommends wheels for steel, cast iron and nonferrous metals through a wide range of grits and grades. Sizes can be supplied for all cut-off equipment.

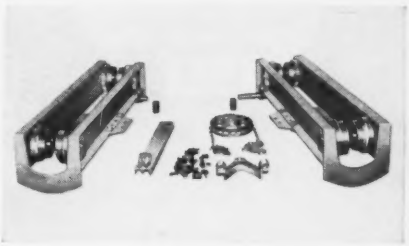
For More Details Circle No. 9—Page 197

Safety Goggles: General Scientific Equipment Co., 2700 West Huntingdon St., Philadelphia 32, Pa.—Featherweight, plastic safety goggles weigh only 1 ounce, are breakproof and suitable for wearing over prescription glasses. Hard-surface acetate lenses, clear or medium green, offer resistance to abrasion, sparks, flying chips and spatter.

For More Details Circle No. 10—Page 197

Epoxy Adhesive: Miracle Adhesives Corp., 214 East 53rd St., New York 22, N. Y.—Epoxy adhesive requires no mixing, has a pot life of 30 days and over and was developed for use where large amounts of adhesive are required in production processes. According to the manufacturer, shear strengths of over 3000 psi have been maintained.

For More Details Circle No. 11—Page 197



Crane Assemblies: Material Handling Division, Conco Engineering Works, Mendota, Ill.—Build-it-yourself crane assemblies include an underhung hand-geared crane, a top running hand-geared crane and both single and multiple trolley underhung push type cranes, each available on a package basis. Assemblies

New Machine Automates Testing Procedures

AUTOMATICALLY controlled physical testing machine features an automatic typewriter for printing test results and has reduced testing to pushbutton simplicity. To operate, the operator inserts the specimen, presses a button and the amount and duration of load applications are repeated accurately and indefinitely until changed. All phases of production tensile tests are controlled by a built-in programmer. These preset controls minimize the time required to conduct successive tests and assure uniformity of testing procedure for any number of tests with similar specimens.

A separate electric typewriter automatically prints the yield strength for the selected percentage of offset, plus an identifying test number as each specimen is tested. Yield strength or other data are determined immediately without interpolation of a stress-strain curve. The automatic program controller is available for use in automatic production testing, production proof testing, yield strength by extension under load, stress cycling, strain cycling, crosshead cycling or any of these in combination as required. The machine is manufactured by the Tinius Olsen Testing Machine Co., 5010 Easton Rd., Willow Grove, Pa.

For More Details Circle No. 12—Page 197

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A complete range of sizes, standard or made-to-order.

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For tough cleaning jobs or surface finishing of heat-treated parts.

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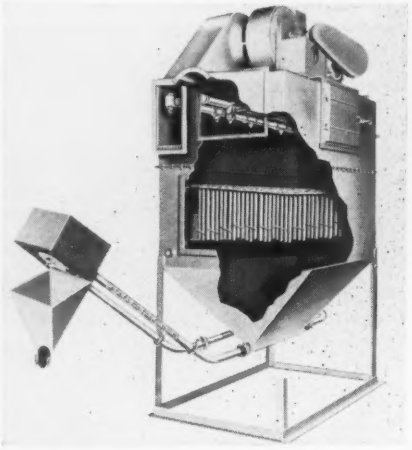
are shipped with all necessary parts except I-beam and cross shaft. Capacities of various units range from ½ to 5 tons and spans to 30 ft.

For More Details Circle No. 13—Page 197

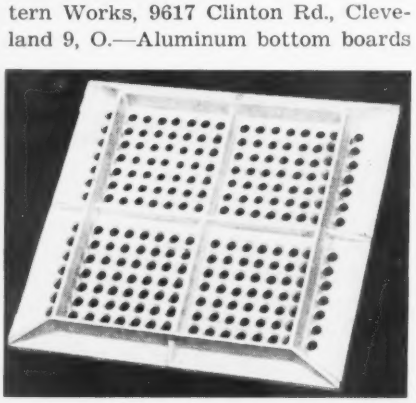
Dust Control: Johnson - March Corp., 1726 Chestnut St., Philadelphia, Pa.—Dust control unit is said



to remove microscopic solids, fumes and odors from exhaust gases at 99 per cent efficiency. It can be used anywhere impurities are encountered of extremely low and even submicron size particles. The unit collects dust by hydro-compressing exhaust gases through a system of multiple tubes into a water chamber. Violent water agitation causes secondary pressure turbulence and additional scrubbing action in the tube chamber. Scrubber comes in 15 sizes for capacities ranging from 500 to 40,000 cfm. Sludge can be removed constantly or intermittently by manual, hydraulic or mechanical means.

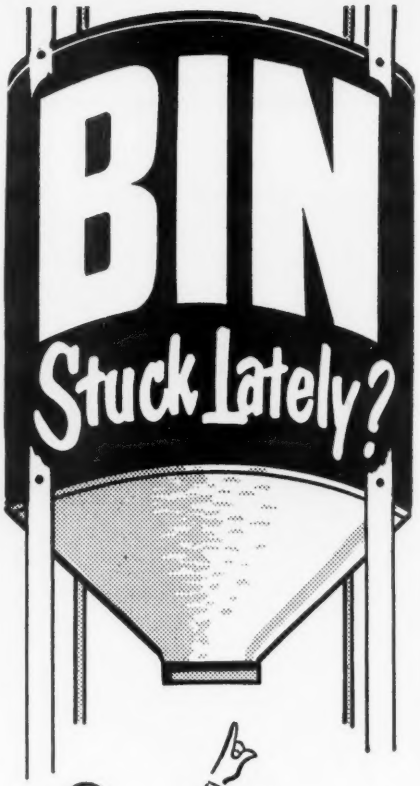
For More Details Circle No. 14—Page 197

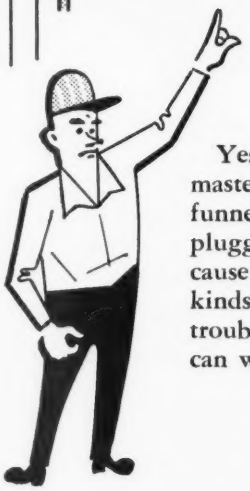
Bottom Boards: West Way Pattern Works, 9617 Clinton Rd., Cleveland 9, O.—Aluminum bottom boards



are custom-cast to individual foundry specifications. Boards are ribbed for strength and rigidity and can be cast (as shown) with holes to increase lightness and allow for gas escapement. Manufacturer claims the boards will not warp or burn. Being impervious to weather conditions,

BIN Stuck Lately?





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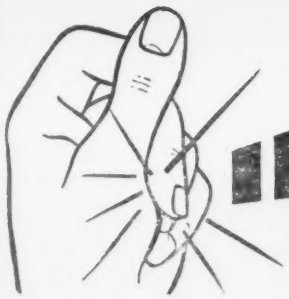

IDEAS FOR FOUNDRYMEN

HERE ARE QUICK REVIEWS OF NEW LITERATURE—available to foundrymen as "idea" and reference information. Readers in the United States and Canada may obtain copies by using the attached cards. Readers in foreign countries should write direct to the manufacturer offering literature.

81. Buckets

Blaw-Knox Co., Blaw-Knox Equipment Division, Pittsburgh, Pa. — "Maintenance and Care of Clamshell Buckets" contains 40 pages of illustrations and new information on maintenance, care and repair of clamshell buckets. Proper lubrication practices and list of common abuses leading to early bucket failure also are included.

82. Gamma Ray Sources

Metal & Thermit Corp., 100 East 42nd St., New York 17, N. Y.—Booklet describes portable gamma ray projectors for use in pipe and field work, pressure vessels, tanks, large pipe and nondestructive testing. Radioactive materials, isotopes, kinds of radiation and "hard" and "soft" rays also are discussed.

83. Moisture Eliminator

Jas. A. Murphy & Co., Hamilton, O. —Construction and operating features of aftercooler systems designed to fit into and be an integral part of compressed air pipe line systems for elimination of condensed moisture without loss of pressure or waste of air by leakage are described in bulletin.

84. Conveyors

Lamson Corp., Syracuse 1, N. Y. —Form C-205 provides detailed information, specifications, illustrations and application data on roller gravity, wheel, belt and live-roll conveyors for laying out a conveying system using pre-engineered "install-it-yourself" units.

85. Alloys

Alter Co., Alloy Metal Division, 1700 Rockingham Rd., Davenport, Iowa—Booklet contains general information on standard and special alloys for use by iron, steel, nonferrous and precision casting industries. Temperature color scales, melting points of metallic elements, density and weight tables and a temperature conversion table also are included.

86. Atomic Energy

Union Carbide and Carbon Corp., Room 308, 30 East 42nd St., New York 17, N. Y.—Booklet, "The Atom in Our Hands," describes some of the work being done at the atomic energy center at Oak Ridge, Tenn., as well as a glimpse of peaceful atoms at work in industry, medicine and agriculture.

87. Heat Treating

Lindberg Engineering Co., 2450 West Hubbard St., Chicago 12, Ill.—Bulletin CT-1 introduces electric heating elements for heat treating furnaces. Elements consist of corrugated sheets of nickel chromium designed to hang from hooks and nearly cover walls of the furnace.

88. Cranes

Bedford Foundry & Machine Co., Bedford, Ind.—Illustrations, specifications, special features, application and engineering data on steel mill, bucket, gantry and industrial cranes designed to handle loads from 5 to 300 tons or more are found in catalog G.

89. Melting Furnaces

Ajax Electrothermic Corp., Trenton 5, N. J.—Bulletin 26-B provides data on applications, principles of operation, melting performance, controls and refractories for high frequency furnaces for nonferrous melting with motor-generator equipment.

90. Ductile Iron

International Nickel Co., 67 Wall St., New York 5, N. Y.—Revised edition of booklet, "Ductile Iron, the Cast Iron That Can be Bent," provides up-to-date information on ductile iron, shows applications of cast-

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ings produced and used and lists typical applications in various industrial fields.

91. Titanium

Arthur D. Little Inc., 30 Memorial Dr., Cambridge 42, Mass.—Folder contains list of commonly available titanium alloys and compositions, forming and welding methods, heat treatment and machining information as well as a brief comparison of titanium properties with those of stainless steel and aluminum alloy.

92. Grinding Wheels

Peninsular Grinding Wheel Division, Abrasive and Metal Products Co., 729 Meldrum Ave., Detroit 7, Mich.—Catalog 5E provides sizes, specifications, prices and general information on grinding wheels, segments, mounted points and related miscellaneous products.

93. Shot and Grit

National Metal Abrasive Co., 3560 Norton, Cleveland, O. — Booklet on the use of shot and grit is designed to serve as a guide in the examination of blast cleaning and peening problems and help to establish a yardstick against which to measure metal abrasives.

94. Air Systems

J. O. Ross Engineering Corp., 444 Madison Ave., New York 22, N. Y.—Bulletin 52 offers illustrations and general information on air systems for the foundry industry with emphasis on core ovens and cupola heating.

95. Grinding Wheels

Norton Co., Worcester 6, Mass.—"How to Select Grinding Wheels for Precision Grinding, Tool and Construction Steels," consists of three reprints of articles written by a grinding engineer. Numerous charts and photographs are included.

96. Water Clarification

Eimco Corp., Process Division, 301 South Hicks Rd., Palatine, Ill.—Bulletin F2034C presents a series of questions and answers about a water treatment process for economical handling of all types of foundry waste waters.

97. Castable Refractory

North American Refractories Co., National City-East 6th Bldg., Cleveland 14, O.—Bulletin 108 covers physical properties and applications of a 3000° castable refractory for heavy duty service as around burner openings, burner blocks, door linings,

98. Vacuum Degassing

Centrifugal Casting Machine Co., P. O. Box 947, Tulsa 1, Okla.—Bulletin 155 provides schematic drawings and general information on vacuum degassing ladles as well as a vacuum degassing chamber.

99. Melting Furnaces

Stroman Furnace & Engineering Co., 9900 Franklin Ave., Franklin Park, Ill.— Illustrations and brief descriptions of a variety of melting and holding furnaces for ferrous and nonferrous metal melting are found in bulletin 900.

100. Quality Castings

Herbert A. Reece & Associates, 960 Union Commerce Bldg., Cleveland 14, O.—Booklet for designers and engineers elaborates upon licensed casting techniques for providing strength and solidity in castings.

101. Hoists

Harnischfeger Corp., P&H Hoist Division, Milwaukee 46, Wis.—Bulletins H-37, H-38 and H-39 contain descriptions of principal engineering features and condensed specifications of electric hoists.

102. Automatic Pouring

Ajax Engineering Corp., Trenton, N. J.—Folder R-48 describes characteristics and operation of combination induction melting and holding furnace and automatic pouring for aluminum die casting.

103. Wet Dust Collector

Dust Suppression and Engineering Co., P. O. Box 67, Lake Orion, Mich. —Wet dust collector that separates dust from air by centrifugal action while wetting and trapping dust by water is described in bulletin 551.

104. Fume Control System

Martin Equipment Co., Box 173, Wabash, Ind.—Bulletin 555 provides illustrations, dimensional drawings and general information on fume control system for ventilation of pouring operations.

105. Cranes

Whiting Corp., Harvey, Ill.—Bulletin M-30 presents information for executives concerned about the place of overhead materials handling in the continuing trend towards automation.

106. Mold Spray

Frederic B. Stevens Inc., 1800 Eighteenth St., Detroit 16, Mich.—General information on mold spray developed to eliminate lengthy torching of molds and tunnel oven drying is found in bulletin FP-127.

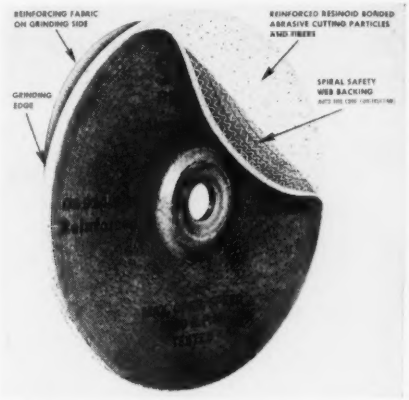
107. CO_2 Process

Liquid Carbonic Corp., Compressed Gas Division, 3100 South Kedzie Ave., Chicago 23, Ill.—Technical bulletin 33A contains general information on the CO_2 process.

they may be stored outdoors without damage. In event of accidental breakage, supplier will repurchase damaged units.

For More Details Circle No. 15—Page 197

Abrasive Wheels: Simonds Abrasive Co., Tacony and Fraley Sts., Philadelphia 37, Pa.—Web backing of spiral-wound rayon incorporated into abrasive wheels for portable grinders is said to impart extra strength and safety. Wheels are lightweight, rigid type reinforced resinoid bonded made in depressed center or raised hub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SPIRAL SAFETY WEB BACKING

shape in 7 and 9 in. diameters by 3/16 and ¼ in. thicknesses. Their field of application is for production grinding of welds, removing flash and bead, cleaning up rough ragged surfaces and edges and for all types of stainless steel.

For More Details Circle No. 16—Page 197

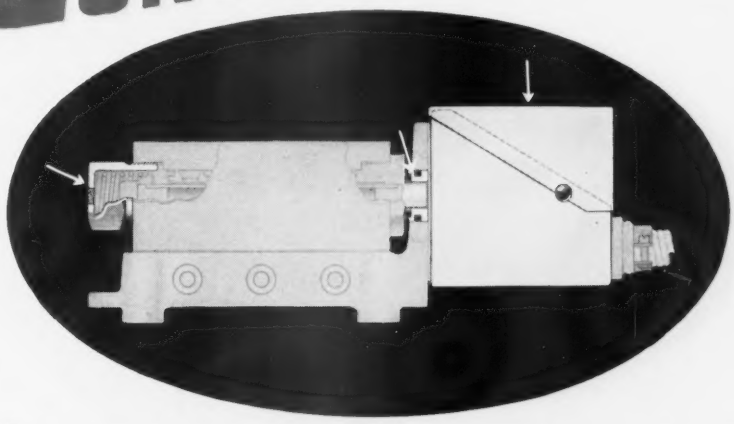
Plow Attachment: Prime Mover Co., Muscatine, Iowa—Snow plow attachment can be installed to company's ¾-ton powered wheelbarrow.

Fifty-inch angling blade can be dropped off to permit the unit to resume its normal materials handling operations. Manufacturer recommends that when blade is being used, the 10 cu ft bucket be filled with ballast or sand for spreading on icy walks or drives.

For More Details Circle No. 17—Page 197

Lift Truck: Hyster Co., 2902 North East Clackamas St., Portland 8, Oreg.—Compact, maneuverable 5000-lb lift truck has an outside turn-

SELECT
Quick-As-Wink®
AIR AND HYDRAULIC
CONTROL VALVES

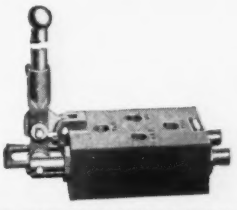


New Dust-Tight Construction
for SOLENOID VALVES
protects all operating parts from Dust and Grit

• Now you can get even greater value in Quick-As-Wink Solenoid Valves — *at no increase in price.* They've been dust proofed. A sintered bronze filter in the breather hole permits air to pass through in either direction, but prevents the entrance of dirt. A sleeve with two "O" rings assures dust-free operation where the solenoid armature contacts the valve plunger. The overlapping cover for the solenoid fits tightly but can be removed easily. It protects the solenoid even from the dust and grit blown around during "cleaning up" operations; provides ample space in which to connect the control wiring to the solenoid leads; and permits the splice to be tucked away inside the cover, not pulled back into the piping. Write for full details — *today!*

Ask us also about...

DIAPHRAGM OPERATED "O-TYPE" VALVE, can be actuated with instrument air as low as 12 to 15 psi.



LEVER OPERATED HYDRAULIC VALVE suited for water or hydraulic oils up to 5000 psi. 2-way, 3-way and 4-way actions.

Quick-As-Wink®
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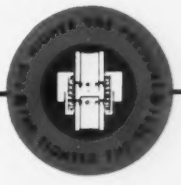
Control Valves

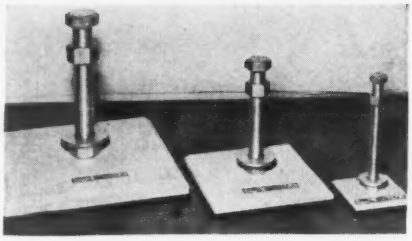


Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated
Mfd. by C. B. HUNT & SON, INC., 1976 East Pershing St., Salem, Ohio

ing radius of 79 in. Short length, low center of gravity and long wheelbase are designed to improve traction, weight distribution and operating ease. Gasoline power is standard but diesel or liquefied petroleum power plants are optional.

For More Details Circle No. 18—Page 197

Leveling Mount: MB Mfg. Co., Division of Textron-American Inc., 1060 State St., New Haven 11, Conn. —Leveling mount permits leveling of machinery of all kinds without lagging to the floor and is said to reduce transmission of machine noise,



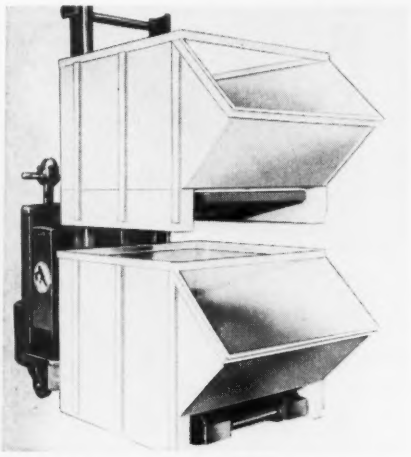
shock and vibration. Unit consists of a metal plate with a neoprene pad cemented to it, a threaded bolt, flanged leveling nut and a lock nut. Mount is available in six models of three sizes, 3 x 3, 6 x 6 and 9 x 9 in., with two types of pads depending upon the loading. Permissible load ranges extend from 100 to 12,000 lb per mount.

For More Details Circle No. 19—Page 197

Temperature Control: Automation Instrument Corp., 1516 Summer St., Philadelphia 2, Pa.—Temperature indicating, electronic, contact-controller is said to automatically hold and control process temperatures as high as 2500° F to within ±1 per cent of scale. Unit is available in five ranges: 0° to 600°, 1000°, 1500°, 2000° and 2500°. Thermocouple break protection is included.

For More Details Circle No. 20—Page 197

Palletized Bins: Stackbin Corp., 1079 Main St., Providence, R. I.—All welded, heavily reinforced sheet



metal bins have an underclearance to fit all types of fork and platform trucks. Hopper front keeps contents visible and accessible for inventory and further processing. Bin illustrated has capacity of four large drums and is 36 in. wide x 24 in. deep x 48 in. long, including 12 in. hopper front. Bins can be made to customer specifications.

For More Details Circle No. 21—Page 197

Sander: Thor Power Tool Co., SpeedWay Mfg. Division, Aurora, Ill. —Electric, orbital-motion sander for general use has a sanding area of 4½ x 5⅛ in. Weight is 5 lb. Motor is a two-pole, induction type and operates on 115 v, 60 cycle ac only. A 6-ft., two-conductor lead cord is standard equipment. Models using other voltages at 50 cycle can be supplied.

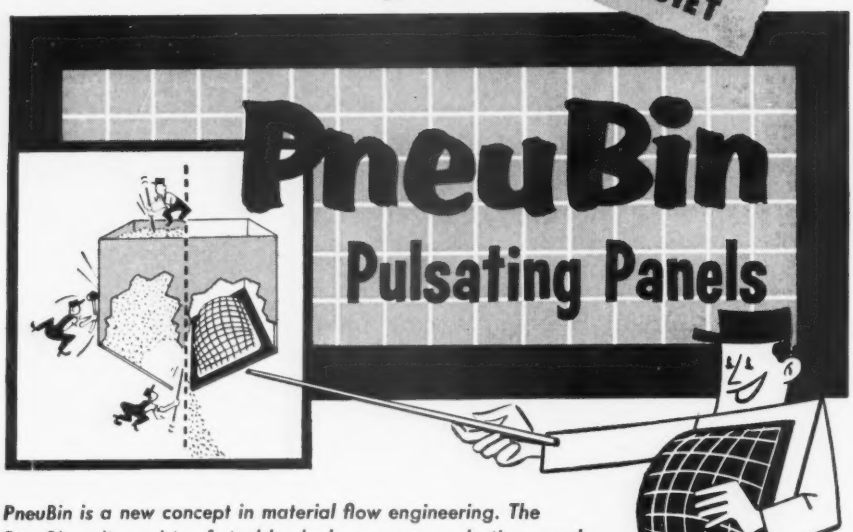
For More Details Circle No. 22—Page 197

Speed Reducer: Philadelphia Gear Works, "G" St. below Erie Ave., Philadelphia 34, Pa.—Combination helical and worm gear speed reducer drive is for use in overhead, trolley, floor and pit type conveyors;

Assure constant material flow from your bins and hoppers with . . .

DEPENDABLE SAFE ECONOMICAL QUIET

PneuBin Pulsating Panels



PneuBin is a new concept in material flow engineering. The PneuBin unit consists of steel-backed, neoprene, pulsating panels, strategically located on the inside walls of your present bins. Working off the plant's regular air supply, PneuBin is inflated and deflated in controlled cycles, causing the contents of the bin to be "positively displaced" and thus assures free flow of material through the discharge opening.

DEPENDABLE—PneuBin is on the job *whatever* the material flow problem. PneuBin's principle of "positive displacement" moves the bin contents, not the bin . . . assures constant, free-running material discharge. *Depend on PneuBin to insure material flow.*

SAFE—No manpower is needed to facilitate material flow from bins when PneuBin is on the job. No more prodding, poling or sledge-hammering. *Depend on PneuBin to insure material flow . . . safely.*

ECONOMICAL—PneuBin cuts maintenance costs, saves money year after year. Reduce bin damage . . . increase bin life. *Depend on PneuBin to insure material flow . . . safely, economically.*

QUIET—PneuBin pulsating panels breathe . . . not snore. No hammering or loud vibration noises. PneuBin's quiet operation adds to overall plant efficiency . . . reduces employee fatigue. *Depend on PneuBin to insure material flow . . . safely, economically, quietly.*

Send for "Flow Stoppage" and free literature. PneuBin engineers will gladly make recommendations with no obligation on your part.

PneuBin

A PRODUCT OF

GEROTOR MAY CORPORATION

1533 Maryland Ave., Baltimore 3, Maryland

Here's a belt that is amazing foundry men

U. S. FoundryGiant Belt carrying shakeout sand.

It's U. S. Rubber's FOUNDRYGIANT Glass Fabric Belt

Consider its performance as reported by one of the largest and most modern foundries in California. One 18″ wide U. S. FoundryGiant belt carrying very hot reclaimed sand has lasted four times longer than any previous belt.

A second U. S. FoundryGiant glass fabric belt carries extremely hot shakeout sand back to the reclaiming system. A third U. S. FoundryGiant belt carries molding sand to the hoppers.

This foundry also uses other "U. S." quality products—pilot pipe and pinch valves to carry sand in a water slurry. The foundry management reports *high satisfaction* with the performance of all these "U. S." products.

The quality *and* durability built into everything made by "U. S." for the foundry industry lowers maintenance and overhead costs. "U. S." products are obtainable at any of our 27 strategically-located sales offices, or write address below.

Large pinch valve used in a water slurry.

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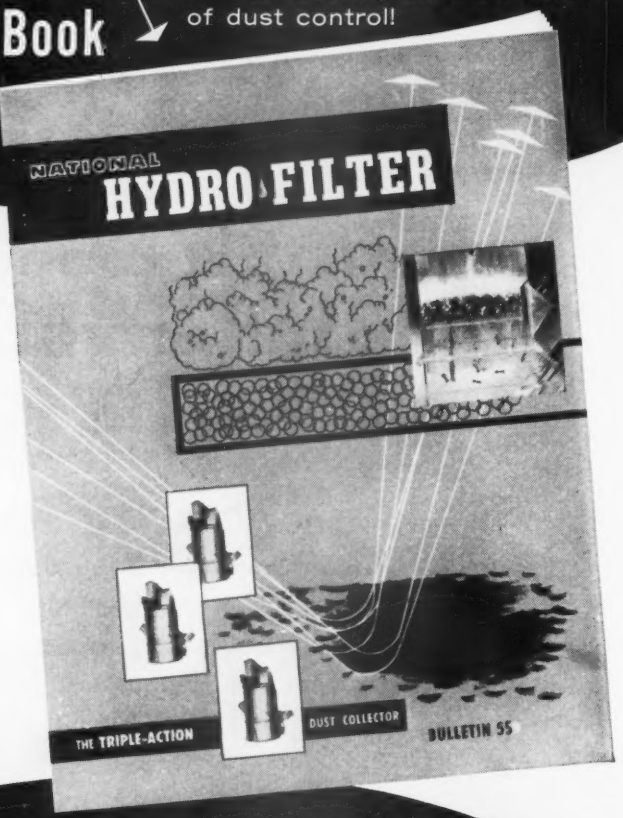
Here is the Book that describes an entirely new concept of dust control!



Here is the Collector . . .

that takes advantage of the most effective dust control principle known to man—that of simple filtration. In so doing it will promise three advantages, sought for wherever dust control or maintenance of wet type dust collectors is a problem:

EASE OF MAINTENANCE No moving parts to corrode.

CONSTANT EFFICIENCY over wide variations in load; —self cleaning on 24 hr. basis.

EXTREME SIMPLICITY makes it a tool that is easy to understand, operate and maintain.

WRITE FOR BULLETIN 55 today!

Details on operating principle, the 14 (500 to 25,000 cfm) models available and a record of test results with the Hydro-Filter are included.

NATIONAL HYDRO-FILTER

Dust Collector Corp.

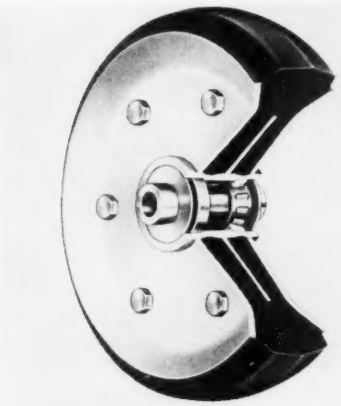
600 Machinery Hall Bldg.,
Chicago 6, Illinois

Subsidiary of National Engineering Company, Manufacturer of Simpson Mix-Mullers.

reducer is mounted so that the output shaft is horizontal or vertical to suit mounting conditions, with input shaft at the horizontal right angle. Units are available in a wide range of output speeds. Dust and dirt proof operation is assured as units are completely enclosed. Construction prevents oil leakage around the output shaft, even in the vertical down shaft position.

For More Details Circle No. 23—Page 197

Industrial Wheel: Roll Rite Corp., 801 Jefferson St., Oakland, Calif.—Industrial wheel uses a mold-



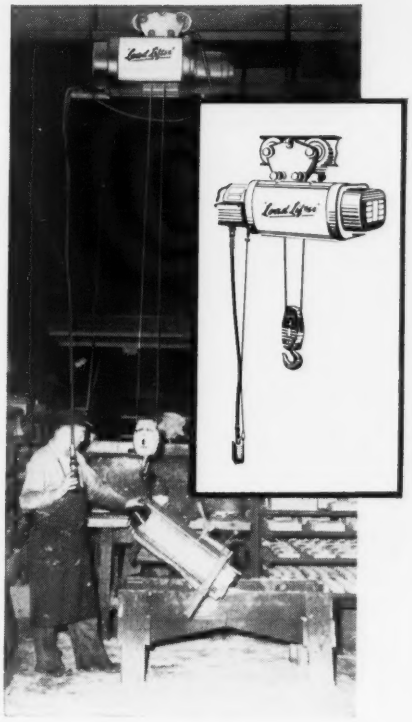
ed rubber tread bonded vertically between two steel disks. By compressing the two disks, a displaced and inflated tread is produced that supports heavy loads and rolls and swivels with ease. Compression from the disks allows the tread to resist flattening under heavy loads. Current production includes 6, 8 and 10 in. diam wheels with new sizes being prepared.

For More Details Circle No. 24—Page 197

Heat Treating: Ipsen Industries Inc., Rockford, Ill.—Line of heat treating furnaces has been redesigned to meet increased standards of capacity, ruggedness and efficiency. Heating capacity is 1000 lb per hr with a maximum weight per charge of 1200 lb. Output of gas-fired and electric units is 720,000 Btu and 72 kw, respectively. Maximum operating temperature is 1850° F. Over-all dimensions are width 6 ft 1 in., length 30 ft 3 in., and height 12 ft 1 in. Hearth is 30 in. wide, 48 in. long and 20 in. high.

For More Details Circle No. 25—Page 197

Lift Trucks: Yale & Towne Mfg. Co., 11000 Roosevelt Blvd., Philadelphia 13, Pa.—Series of industrial lift trucks in capacities from 3000 to 8000 lb are equipped with torque transmissions to provide fully automatic gear shifting. Engine lugging is eliminated since torque multiplies in infinitely varying ratios and the



2 SPEEDS
SAVE MORE THAN ONE!

It takes careful, accurate handling to set cores, draw patterns and close flasks. That's why the two-speed Series "700" 'Load Lifter' Electric Hoist rates so high with foundrymen. Low speed is slow, creeping — no jerky starts! Lifting and lowering action is smooth, safe — only one-third as fast as high!

Two-speed push-button control starts slow or fast hoisting instantly — at the touch of a finger! Every load can be handled at the right speed at the right time. Spotting is easier, more precise. You save time, materials and avoid trouble.

If you want permanent savings, make the two-speed Series "700" 'Load Lifter' a part of your cost-cutting program. It's a heavy-duty hoist — always dependable, always efficient. Capacities: ½ ton up. Your "Shaw-Box" Distributor has details — or write us for Bulletin 410.

MAXWELL MANNING MOORE INC. TRADE MARK

'Load Lifter' ®

ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.
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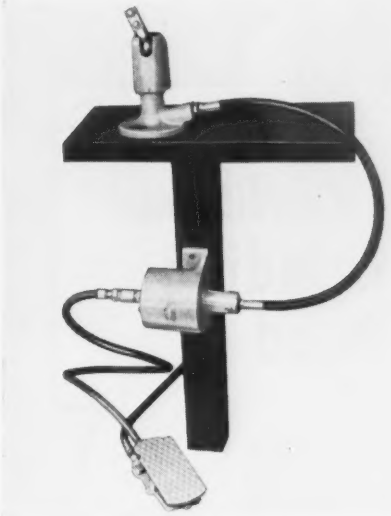
Builders of "Shaw-Box" and 'Load Lifter' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' and 'American-Microsen' Industrial Instruments, and Aircraft Products.

transmission automatically puts the truck in the most suitable ratio relative to load and speed.

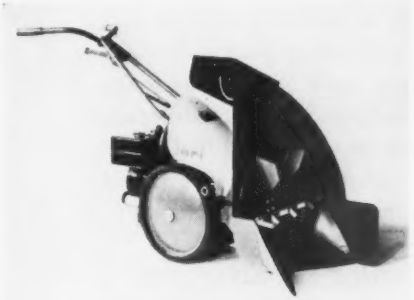
For More Details Circle No. 26—Page 197

Work Positioner: Wilton Tool Mfg. Co., 9525 Irving Park Rd., Box 56, Schiller Park, Ill.—Air-powered work positioner is made in five models ranging from 5 to 1000 lb work capacity. Power at 60 to 100 psi from factory system can be used as power source. System is connected through foot pedal into an air-hydraulic booster cylinder. Air pressure is multiplied and converted to hydraulic pressure, which is transmitted through a shielded hose into the body of the positioner. A universal ball-and-socket arrangement permits work to be moved through all three planes.

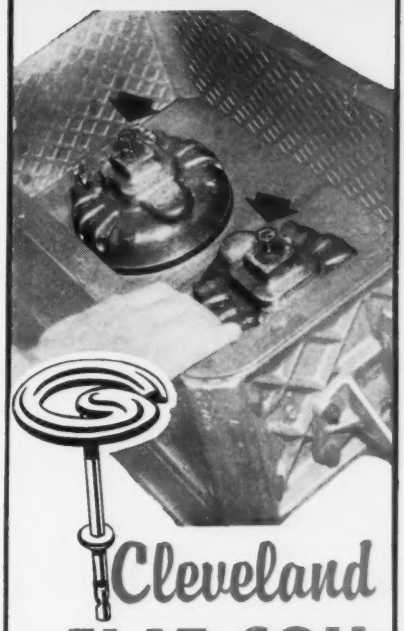


For More Details Circle No. 27—Page 197

Snow Removal: Jari Products Inc., 2990 Pillsbury Ave., Minneapolis 8, Minn.—Snow throwing machine features a raker bar that cuts up heavily packed or deeply piled snow. Raker bar contains six flat steel teeth mounted on a whirling fan. Bar is arranged so that each tooth travels in a separate plane, cutting snow into small pieces that can be thrown aside by the fan. Rotary machine is self-propelled and powered by a 4-cycle, 2½-hp gas en-

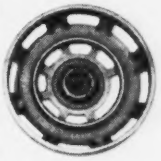


TAYLOR & BOGGIS
USES 18% LESS SAND
SAVES LABOR WITH...



Cleveland
FLAT COIL
CHAPLETS

Note clean chaplet breakoff on end bell hub which reduces cleaning operations.



Due to their low cost, Taylor & Boggis also uses flat coil chaplets for soldiers in deep green sand core pockets.

Only 1/2" to 1" of sand cover is required in the cope for firm support of these end bell core chaplets. Flasks are lighter and 18% less sand is handled on the end bell mold line.

In addition to providing positive core support, Cleveland Flat Coil Chaplets speed molding at Taylor & Boggis due to uniform stems and plating thickness. Check today for details on flat coil chaplet advantages in your molding lines.

Write today for *sample* and catalog!

Cleveland Since 1890
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CESCO ***RIGHT... before your Eyes!***

CESCO No. 10256

NOW... an Air-Conditioned Grinding Hood

Now complete protection can be provided to every worker who must do grinding in an area where exhausting of abrasive-laden air is impractical. The CESCO No. 10256 Grinding Hood with its supplied air unit was designed for this service and has proved invaluable in use by hundreds of workers.

The CESCO Grinding Hood slips on quick, and gives complete breathing protection. The air supply is regulated by the wearer to suit his breathing.

The large full-view window is made of acetate and easily replaced when necessary. There is plenty of room inside the hood so the user can wear safety glasses or goggles. Comfortable fitting headgear prevents slipping. The hood is made of durable, washable, double-filled khaki duck. Helmet-headgear combination is fastened to hood by a slide fastener for quick removal and attachment.

•

See your CESCO safety equipment distributor for further information on the CESCO No. 10256 Grinding Hood, or write for details today

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CESCO FOR SAFETY

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gine, engineered to clear a path 20 in. wide through any depth or type of snow at a rate of 520 shovelfuls per minute.

For More Details Circle No. 28—Page 197

Pallet-Type Box: Hamlin Metal Products Co., 2741 Wingate Ave., Akron 19, O.—Lightweight, heavy-duty, folding pallet-type steel box

for materials handling, storage and shipping can be assembled or folded in seconds and has no loose pins or parts. Folded for dead storage or return shipment, the unit measures 40⅜ x 7 15/16 in. Assembled for use, it is 28¾ x 40⅜ x 48½ in. OD. Box weighs 180 lb and has a static capacity of 5000 lb.

For More Details Circle No. 29—Page 197

Mobile Crane: Mercer-Robinson Co., 30 Church St., New York 7, N. Y. — Self-propelled hydraulic cranes of 5, 7½ and 10 ton capacities

feature a boom topping actuated by a 7-in. ram which allows the boom, when extended, to be raised to a maximum height of 27 ft. Hoist and boom topping arrangements are hydraulic and reportedly offer safe, smooth lifting because of steady, even power supply through a four-speed gear box. Road traveling speeds range from 3 to 30 mph.

For More Details Circle No. 30—Page 197

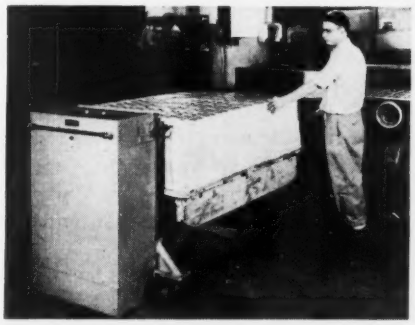
Oil-Fired Heater: Cauhorn Distributing Co., 20722 West 7 Mile Rd., Detroit 19, Mich. — Self-contained, portable, oil-fired heater is designed

to heat exposed or partially exposed places that are impractical to heat by other methods. Heater operates on kerosene or No. 1 fuel oil and

produces up to 190,000 Btu per hr. No installation vent, flue or chimney is required. Unit plugs into any 110-115 v, ac electrical outlet.

For More Details Circle No. 31—Page 197

Skid Lift Truck: General Sales & Engineering Co., 4525 North Clark St., Chicago 40, Ill.—Portable skid lift truck allows a production machine operator to raise or lower a load either on a skid or a platform. Load can be held in any position at convenient working height. Truck is supplied in 2000 to 5000 lb



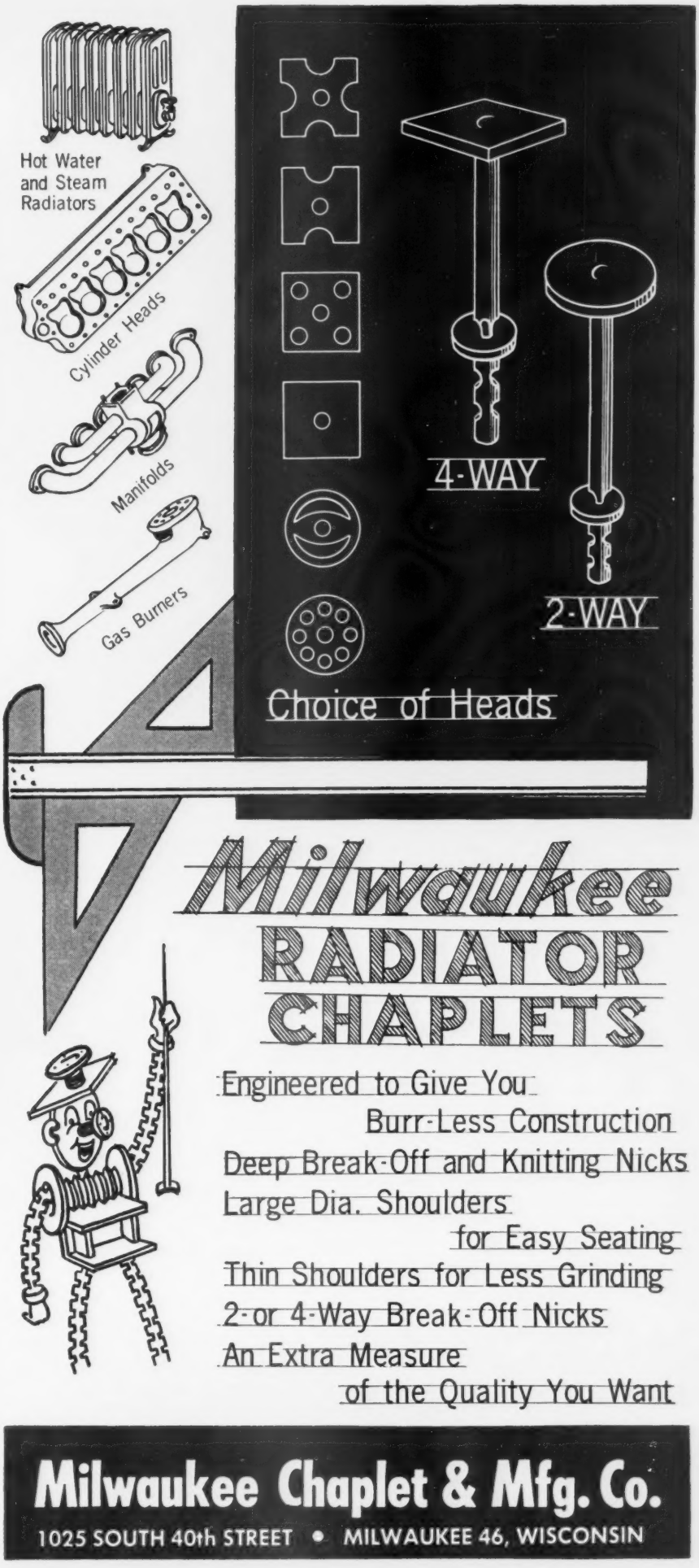
capacities. Lowered height is about 6½ in. above floor level and elevated height is 34 in. Dimensions are 44½ in. high x 44 in. wide at rear casters.

For More Details Circle No. 32—Page 197

Armored Motors: General Electric Co., Schenectady 5, N. Y.—Line of direct current motors is being produced with advanced insulation using Class H materials. New insulation will withstand temperatures to 180° C and its use in normal duty virtually eliminates insulation failure, according to the manufacturer.

For More details Circle No. 33—Page 197

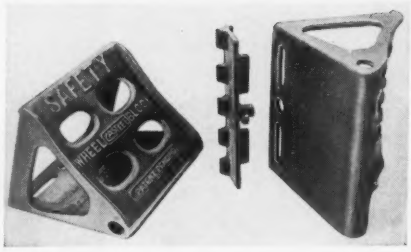
Cold Metal Solder: Alvin Products Inc., Worcester, Mass.—Aluminum-based compound is a moldable paste that hardens upon drying to



form a strong, permanent bond to metal, wood, glass, plaster or plastic. Aluminum pigment, when compounded with resin, dries to a surface which reportedly will not shrink, crack, chip or peel. Material can be filed, drilled, chiseled, tapped or ground. It has been used to fill blow and sand holes in metal castings and to build up long-wearing finish on patterns.

For More Details Circle No. 34—Page 197

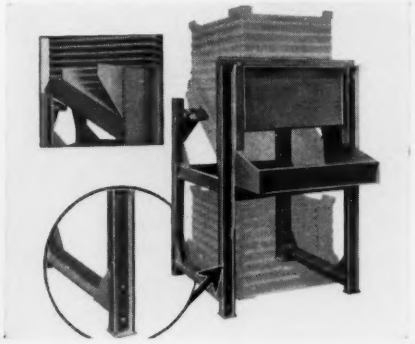
Safety Block: Calumet Steel Castings Corp., Hammond, Ind. — Safety tool for the blocking of car,



truck or trailer wheels is made of special alloy steel said to combine strength with light weight and compact size. Flat base gives support in soft footing while integrally cast gripper teeth at rear edge assure holding power on ice or snow. It measures 7 x 7 x 9 in. and weighs 12 lb.

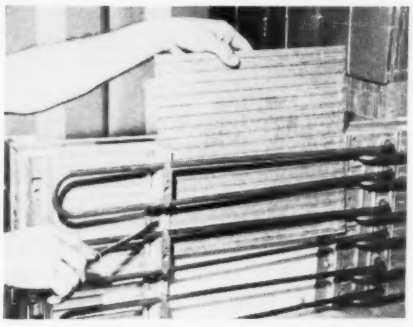
For More Details Circle No. 35—Page 197

Positioning Stand: Palmer-Shile Co., 16033 Fullerton, Detroit 27, Mich.—All-steel welded positioning stand for drop-bottom boxes features safety doors and a removable shelf safety plate. After boxes are unloaded when placed in position on the stand by fork truck, safety doors on the sides of the stand prevent parts fall out. A removable safety plate on the stand shelf permits it to be used as a tray or for discharge onto a table. Stand legs are adjustable. Units are designed to handle two boxes, one for dumping and one for storage. They are built to customer specifications.

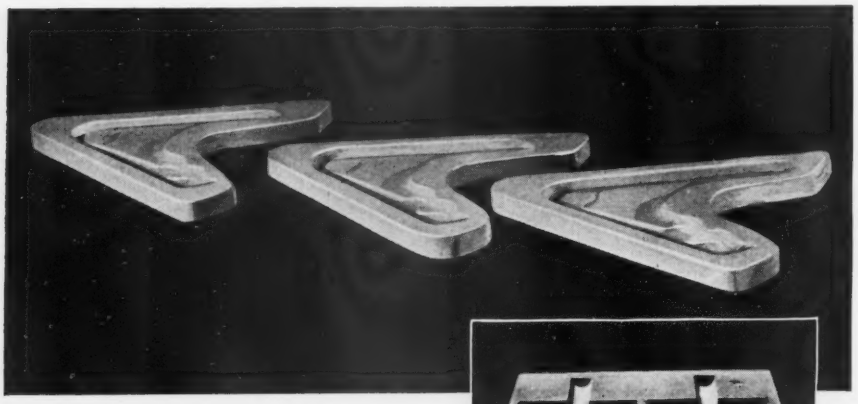


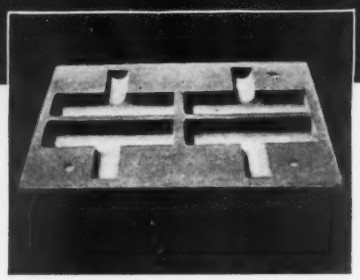
For More Details Circle No. 36—Page 197

Reflector Panels: Rigidized Metals Corp., 808 Ohio St., Buffalo 3, N. Y.—Aluminized steel reflectors are made in more than 40 standard patterns for assembly into ovens, tunnels, continuous overhead panels, side panels, bottom panels and almost any type of heating unit to meet requirements of a variety of industrial processes. Panels deliver over 9200 Btu per sq ft per hr. Sections are complete with built-in insulation. Panels can be made in all ferrous and nonferrous metals, solid or perforated, sheet, strip or coil. Original designs can be custom made.



For More Details Circle No. 37—Page 197





Designed for dielectric furnaces and conventional ovens...

J-M Pallite Plates and Form Driers afford desirable operational advantages

Service records prove that Johns-Manville Pallite outperforms and outlasts many other materials in use in dielectric type furnaces. The advantages of Pallite are due to its special formulation, developed by Johns-Manville for use in dielectric furnace core-drying operations in foundries. Pallite offers the following desirable characteristics:

- **light weight**
- **uniform electrical conductivity**
- **uniform thermal conductivity**
- **dimensional stability**
- **nonsweating**
- **moisture-absorbent**

Pallite Plates are now available in both flat and grooved form. Pallite Form Driers are also available, contoured to support irregular shaped cores properly during their travel through the furnace. For details about J-M Pallite materials, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

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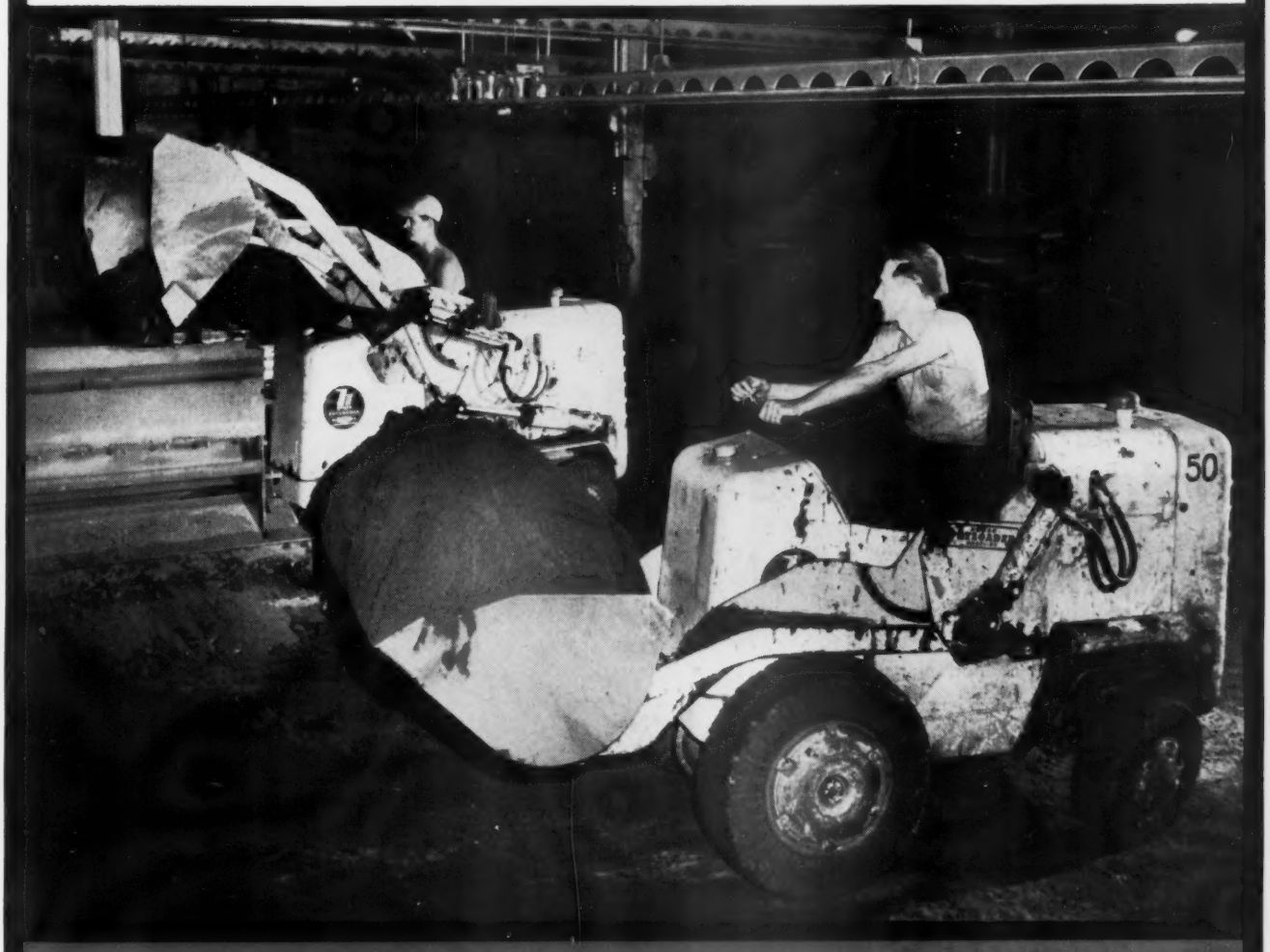
"...roll-back bucket action does 1/3 more work..."



NEW model HA PAYLOADER®

Ohio Stove Company handles hundreds of tons of sand and castings daily with these two model HA's — uses them to scoop up sand and castings from all over the pouring floor, delivering the mixture to the shake-out in ton loads . . . also use them to deliver sand to the molder's stations.

Before buying these two "PAYLOADER" units, Ohio tried other equivalent-size loaders. To use their own words, "the 'PAYLOADER' came way out on top. The two new design HA's with roll-back buckets are doing better than 1/3 more work than machines without roll-back action."

Why don't you find out what this new model HA (18 cu. ft.) or the new, larger model HAH (1 cu. yd.) can do on *your* bulk-material handling jobs? A nearby Distributor will help you select the right size and model from the complete "PAYLOADER" line.

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- ☐ larger models

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CITY

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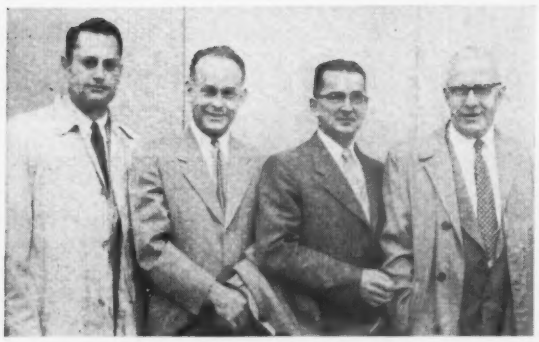


From left to right in these two groups are Henry M. Frechette, Fitchburg Foundry Inc., Fitchburg, Mass., W. J. Francis Jr., R. E. Hayward and James Stringfellow, Draper Corp., Hopedale, Mass.; A. Bouldry, Whitman Foundry Inc., Whitman, Mass.; J. Dalberg, Kidder Press Co., Dover, N. H.; F. Clarke, Whitehead Bros. Co., Providence, R. I.; A. Beck, Whitman Foundry Inc., Whitman, Mass.; L. Iadorola, Pioneer Foundry & Mfg. Co., Gilbertville, Mass.; W. Murdock, Acme Foundry, Chelsea, Mass.

Practices in Small Foundries Considered at NEW ENGLAND CONFERENCE

By EDWIN BREMER
Metallurgical Editor

DESPITE the rain and flood conditions in the area, a good attendance marked the 15th New England Regional Foundry Conference held at Massachusetts Institute of Technology, Cambridge, Mass., Oct. 14-15. A number of the talks presented were directed toward operations of small foundries.

Chairman Henry Stenberg, Draper Corp., Hopedale, Mass., opened the conference and introduced Dr. C. Richard Soderberg, dean of engineering, MIT, who welcomed those present.

At the first session, Raymon F. Meader, Whitin Machine Works, Whitinsville, Mass., speaking on "Green Sand Casting Finish," pointed out that as a matter of pride the foundry should provide a good finish on its products. Moreover, good surface finish to many consumers is an indication of a good, solid casting. Most important factor relating to surface finish is grain size of the sand, according to the speaker—the finer the sand, the smoother the surface.

Mr. Meader recommended choosing a sand with fairly wide screen distribution—for example, with at least 10 per cent on each of four adjacent screens. He also pointed out that 75 to 80 mold hardness gives good surface finish, and advocated constant use of a hardness tester to maintain the proper range. In squeezer machine work he advised use of large pistons to provide suitable pressure to obtain mold hardness, pointing out that with an air pressure of 80 psi a 10-in.-diam piston gives a squeeze of 29 psi on a 12 x 18-in. flask while with a 16-in.-diam piston the squeeze is 74 psi.

In two nonferrous sessions George T. Hubbell, American Refractories & Crucible Corp., North Haven, Conn., discussed care and maintenance of crucibles and refractories, and Charles V. Knobeloch, R. Lavin & Son Inc., Chicago, spoke on manganese and aluminum bronzes. Mr. Hubbell said that a survey of 50 foundries showed cost of crucibles and refractories varied over a wide range, but that in many cases proper attention to care and maintenance would result in a reduction. After a brief description of manufacture of silicon carbide and graphite crucibles he made these recommendations:

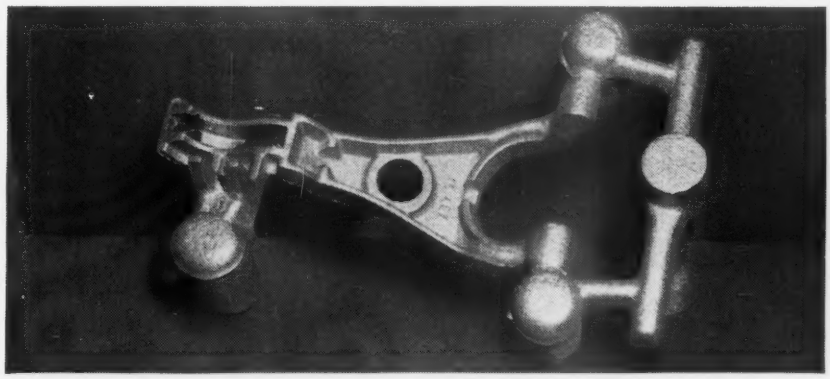
When crucibles are received, inspect carefully for damage. See that they are stored in a dry place. When placing a crucible in use, put it empty in a hot furnace if available; otherwise in a cold furnace and heat as rapidly as possible. Use crucible to its full capacity. Place metal in crucible so that wedging does not occur, and do not leave heels of metal to cool in the crucible. Do not leave crucibles full of molten metal in the furnace any longer than necessary. Keep crucible walls clean by scraping. Avoid use of strong fluxes, and see that tongs and shanks used for crucible handling fit properly.

Mr. Knobeloch said that manganese and aluminum bronzes are similar in their narrow solidification range and tendency toward drossing or foaming due to aluminum content. Hence, the gating systems for both should be designed to insure nonturbulent flow and proper feeding. Chills frequently are required to equalize solidification rates in heavy sections or where feeding is difficult. He recommended that where possible, the original skin be left on the chills, and that before use they be cleaned and coated with oil followed by drying, or coated with rubber-base material.

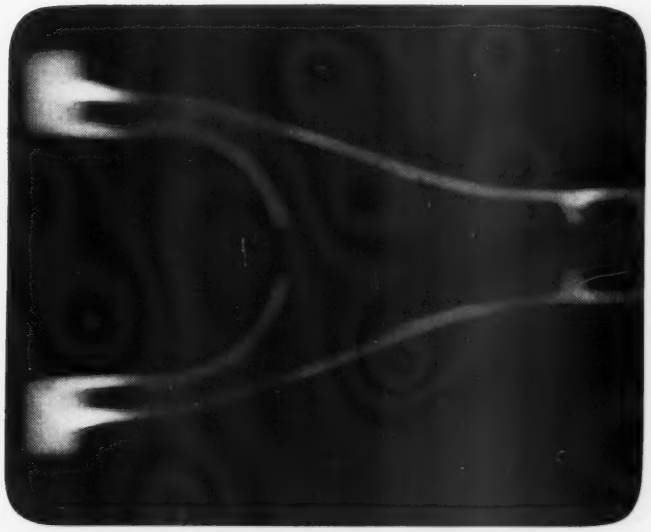
The speaker mentioned that tin up to 1½ per cent in low-strength manganese bronze deters dezincification. However, in high-strength manga-

Some of the representatives of the Charles G. Allen Co., Barre, Mass. All photographs are through the courtesy of the Debevoise-Anderson Co., Boston

Shrink steals strength — and profits



— RADIOGRAPHY points the way to avoid it



THIS steel fork lever was designed to take a specific load. Would it hold up? Not if shrinkage had robbed its strength.

But here is where radiography came in with double-barreled effect. First the radiographs which were made showed the foundryman that internal shrinkage was present. Then the radiographs disclosed a recurring pattern of these defects, thus suggesting a change in molding which greatly reduced the difficulty.

This is typical of the ways radiography helps the foundryman make sure only satisfactory work is delivered and so builds a reputation for high-quality castings.

If you'd like to know how it can improve your own operations, talk it over with your x-ray dealer. Or, if you like, write us for a free copy of "Radiography as a Foundry Tool."

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TRADE MARK

nese bronze, tin over ½-per cent decreases ductility. Lead content should be kept low, although in some cases ½ to 1 per cent improves machinability. The zinc and lead content of aluminum bronzes should be held as low as possible particularly where they are subjected to heat treatment to obtain high physical properties. Both types of bronzes should be melted with a minimum of gas pick-up; keeping the furnace atmosphere slightly oxidizing helps considerably. Moisture, a source of gassing, can be introduced into the molten metal by addition of cold raw materials as well as by cold or damp ladles. For evidence of gassing he suggested use of a cast plug 2½ in. in diam and 3 in. long for observance of "piping" or shrinkage.

In two ferrous sessions Fred C. Barbour, Republic Steel Corp., Cleveland, talked on gases and trace elements in cast iron, and Chester Thomas, National Engineering Co., Chicago, discussed small foundry mechanization. Mr. Barbour said that cast iron and steel scrap are the source of numerous residual or tramp elements due to painting, plating, welding, brazing, etc., as well as to attached nonferrous and other materials. Some elements are not harmful in small amounts, such as nickel, chromium, molybdenum, vanadium, titanium, copper, etc., which often are deliberately added to improve cast iron properties.

However, difficulties may result from relatively small amounts of aluminum, antimony, bismuth, lead, tellurium, tin, etc. Aluminum in the order of 0.05 per cent or even less may cause pinholes in light-section castings poured in soft iron. Antimony, a constituent of enameled scrap and bearing metals, results in reduction of strength and impact. Bismuth, a component of many bearing alloys, decreases the strength of cast iron considerably. Lead may cause reduction in strength and impact values, and tellurium derived from some copper-base alloys is a potent chill producing agent even in as little as 0.001 per cent.

At a ferrous session held simultaneously with one on nonferrous practice at 3 o'clock, Chester Thomas, National Engineering Co., Chicago, spoke on "Economical Mechanization of Small Foundries."

Discusses Casting Defects

At a combined ferrous and nonferrous session W. A. Hambley, Charles A. Krause Milling Co., Milwaukee, discussed defects in castings. He indicated that the main responsibility for defective castings rests on top management since it has the figures relating to production costs of good and defective castings. Those should be examined and corrective steps taken. Much can be accomplished through spirit of teamwork between all the departments. At the conclusion of his talk Mr. Hambley presented numerous slides illustrating casting defects and their causes.

In a following ferrous session William G. Parker, General Electric Co., Elmira, N. Y., discussed "Some Aspects of Sand Practices for the Small Foundry," He said that while the small foundry may not be able to afford to install and operate sand testing equipment, a careful and constant study of available literature on sands, binders, additives, etc., will suggest ideas which can be applied in control of sand.

To illustrate effect of moisture content on sand properties slides were shown of tests at three moisture levels of two sands. One was a compounded or synthetic sand, the other a natural sand. Moisture contents of the compounded sand were 3.0, 3.3

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Just tell us the sizes and quantities of sand strainer cores you are now using, or send us samples of your sand cores. In turn we will send you samples from our large stock of standard size ceramic cores for this test. Don't miss this chance to compare. Write today.

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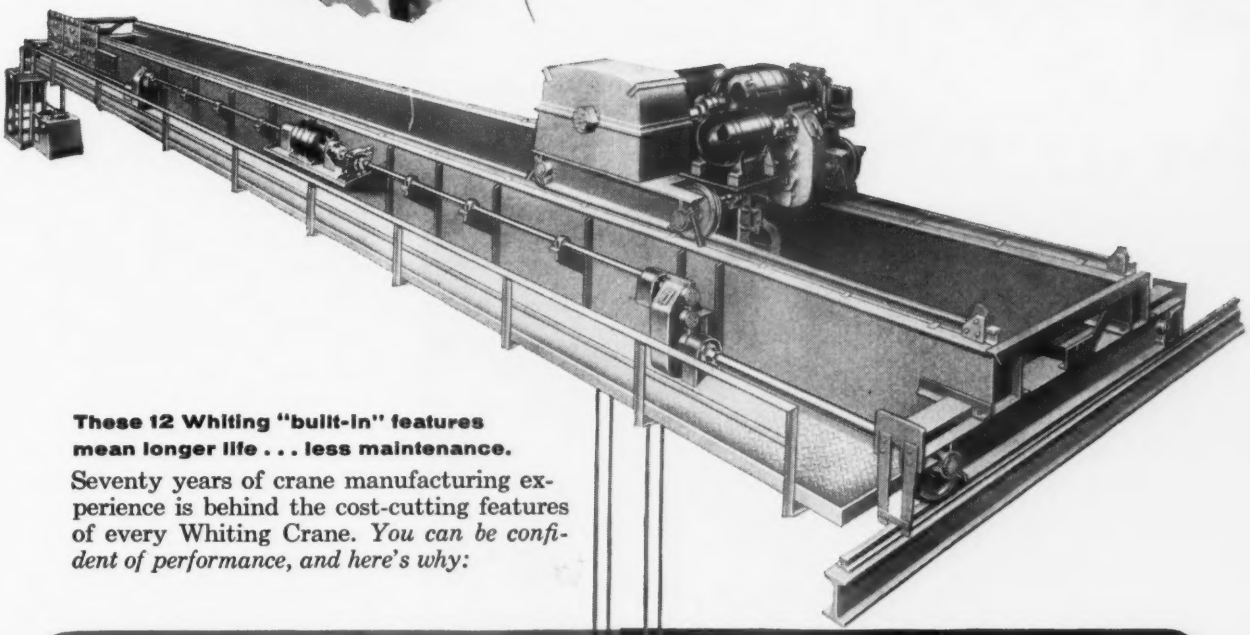

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1. Correct motor selection based on survey of requirements by experienced engineers	1. Speeds selected to match production
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6. Timken Tapered Roller Bearings	6. Longer bearing life
7. Flexible couplings	7. Longer motor and gear life
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and 3.9 per cent, and while not much difference in green strengths was observed, the dry compression strengths were 60, 87 and 180 psi, respectively. In the case of hot compression strengths the values were 121, 287 and 457 psi. With the natural sand the moisture contents were 8.4, 9.0 and 9.6 per cent. Again there was little difference between the green compression strengths, but the dry compression strengths were 21, 33 and 36 psi, respectively, while the hot compression strengths were 18, 26 and 38.

Since low dry compression strength results in sand erosion and high dry compression strength may be responsible for hot cracks, control of moisture is important. Likewise high hot compression strength is the underlying cause of rat tails, buckles, and expansion scabs, and moisture content within predetermined limits will alleviate those problems.

At a nonferrous session Julius Ferrari, Gorham Mfg. Co., Providence, R. I., presented an informative talk on plaster molding. He said that for uniform results care must be exerted in compounding and mixing the plaster medium which, in his foundry, is composed of 40 to 45 per cent western type plaster or gypsum, 25 per cent Wedron sand (80 to 160 grain), 25 per cent fine spun talc fiber, and 5 to 10 per cent high early strength cement. Materials are mixed dry and then added to water in the ratio of 1 lb plaster to 1 to 1½ lb water at about 5 to 10° above room temperature. Plaster is allowed to sink through the water and then stirred with a propeller for 2 or 3 minutes.

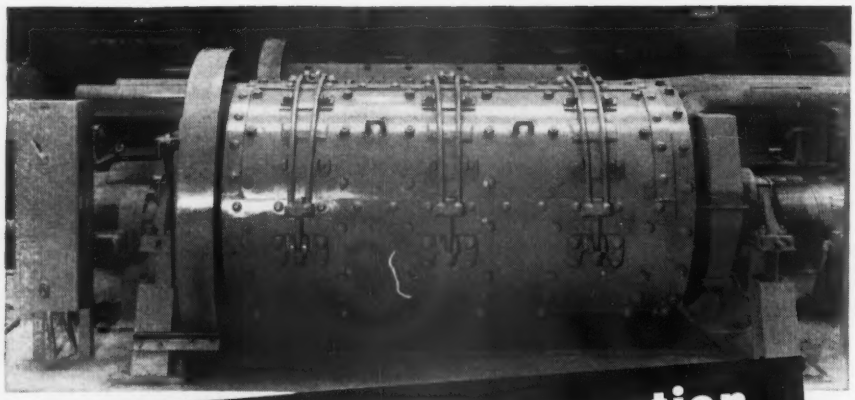
Patterns may be aluminum alloy or bronze and highly polished. They must be kept clean and oiled. When not in use patterns are coated with prime lard oil. When placed in use the coating is cleaned off and the patterns are rubbed down carefully with a mixture of sperm and lard oils so that only a thin coating remains. Flask formed of L-shaped pieces clamped together, is placed over the pattern and the plaster slurry poured in. After the plaster "sets" the flask is removed and the mold separated from the pattern by application of a compressed air jet along the joint. Mold is allowed to air-dry for 24 to 36 hours, then placed in an oven and baked for 72 hours at 600° F. Mold is taken out, checked for dimensional tolerances, closed and placed in an oven at 300° F for 8 to 10 hours. Mold is removed and poured immediately. Molds are shaken out the next day.

Thin Flat Gates Give Good Results

Mr. Ferrari said that thin flat gates appear to give the best results. Risers are small and usually applied for venting purposes. Whistlers, 1/16 to ⅛-in. in diam, are used extensively to insure good venting, especially where thin sections are involved. Chills can be used similar to sand molding to obtain directional solidification. Sand content in the plaster mix promotes chilling, but the amount which can be used is limited since it weakens the structural properties of the plaster and extends the setting time.

Concluding session of the conference had Michael Bock II, Exomet Corp., Conneaut, O., as the speaker. He spoke on gating and feeding with particular reference to the application of insulating and exothermic materials. He pointed out that metals and alloys solidify differently as exemplified by tin bronzes, steel and gray iron, and tend to result in three general types of shrinkage termed concentrated, interdendritic, and cast iron type. In the latter, formation and precipitation of graphite plays

NEW *SLY* "QUIET" TUMBLING MILLS



90% quieter operation

Here's a new way to improve working conditions and increase efficiency when cleaning castings. With Sly "Quiet" Tumbling Mills, sound of operation is 90% less than conventional mills. And the mills have all the many Sly features that add up to low-cost, *complete* cleaning and definning of castings.

The result of more than two years of tests, "Quiet" Mills have a specially-designed sound-deadener of thick Neoprene rubber inside the shell. Drive noise, too, has been greatly reduced by using precision-machined gears and pinions.

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Also Available for Your Present Mills

Sound-deadening equipment can be furnished at nominal cost for installation in Sly Mills already in operation. Your own maintenance crew can do the job. Write for more information.

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an important part by filling void space.

Solidification or cooling of the metal is accomplished by heat flow by conduction and radiation. The former is the more important with alloys poured at low temperature while with alloys poured at high temperature radiation is more important. Where conduction is important insulation around the riser such as accomplished with sleeves, decreases heat loss while radiation losses are decreased by covering the exposed portion of the riser with insulating material. Further decrease in heat losses in both cases may be secured by inclusion of exothermic compounds in the insulating materials which react to supply heat when in contact with the molten metal. By such means the metal is kept liquid longer and promotes better feeding. They also permit reduction in riser size.

Engineering Research Council Issues 1955 Research Index

Engineering College Research Council, American Society for Engineering Education, has issued the 1955 edition of its *Review of Current Research and Directory of Member Institutions,* a biennial publication first issued in 1947. The 352-page volume reports approximately 7500 current research projects at the 105 major engineering schools which comprise the present membership of the ECRC.

Other information includes names of responsible administrative officers, policies which govern research projects and contracts, personnel engaged in research activities and other related information.

Copies of the paperbound book are available at $2 each from Renato Contini, secretary, ECRC, New York University, University Heights, New York 53.

Win Home Safety Awards

Two plants of Electro Metallurgical Co., Division of Union Carbide & Carbon Corp., N. Y., were among the industrial winners of 12 of the 48 National Home Safety Awards recently presented by the National Safety Council, Chicago. The awards are in recognition of public service in home accident prevention during the last year. The winning Electro Met plants are located in Niagara Falls, N. Y., and Alloy, W. Va. Another Union Carbide & Carbon division, U. S. Vanadium Co., Bishop, Calif., also won an award.

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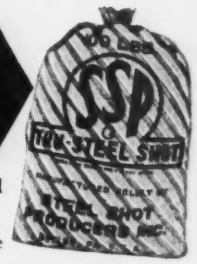

TRU-STEEL will not break into fines that cause wear of machine parts. Cutting down-time and parts replacement, *TRU-STEEL saves you money.*

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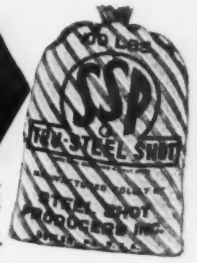

Controlled chemistry and careful control checks give TRU-STEEL the exact hardness for fast, thorough cleaning. Speeding production, *TRU-STEEL saves you money.*

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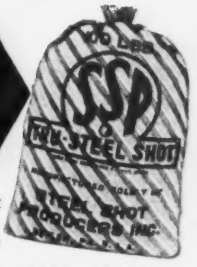

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ASSOCIATION

Discusses Increasing Use of

MAGNESIUM

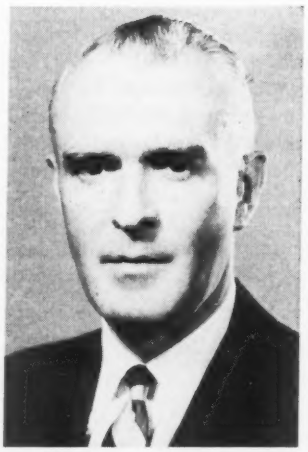
By FRANK G. STEINEBACH
Editor

INCREASING use of magnesium in various forms featured discussions at the fall meeting of the Magnesium Association, held at the Hotel Biltmore, New York, Oct. 31 and Nov. 1. Over 500 attended the meeting. The program was built around the theme "The User Speaks about Magnesium," and many of the papers were concerned with both old and new applications, design factors, and future trends.

Casting continues to be the leading process for the forming of magnesium into components, but the spread between cast and other fabricating processes is slight. Castings have been able to maintain the lead position because of fairly recent progress in the die casting of magnesium. At the present time, not enough organizations have facilities for die casting magnesium. This situation is slowing the growth in the use of magnesium for die castings, but leaders in the field feel it will be corrected shortly. The trend in casting magnesium is away from sand to permanent mold and die casting.

E. J. Willis, Development Division, Aluminum Co. of America, Cleveland, reported on work being done in casting magnesium in plaster molds. Present knowledge on the subject indicates that the size of castings which can be made in magnesium ranges from 1 oz to over 100 lb, but it is believed larger castings will be produced soon. Castings which are as small as 1 in. in maximum dimension to over 3 ft have been cast successfully. Maximum dimensions will increase rapidly as the process becomes better known and its usefulness appreciated.

While surface finish obtained on magnesium sand castings varies considerably from piece to piece, in general it is between 400 and 1000 micro-inches, unless special finishing techniques are used. Plaster casting gives surface finishes in the neighborhood of 100 micro-inches and surfaces as low as 50 to 60 micro-inches can be found in some areas of the casting. In addition to the standard alloys, it is believed that the usefulness of the plaster process may be extended to both magnesium rare earth zirconium and magnesium thorium zirconium alloys if demand for high temperature castings to close tolerance and smooth finish continues.



D. T. Wellman, Wellman Bronze & Aluminum Co., Cleveland, was re-elected president of the Magnesium Association at its annual meeting on Oct. 31 and Nov. 1

Since the German Volkswagen is reported to be the largest single user of magnesium castings in the world, considerable interest centered in a paper on that subject by Ludwig C. Boehner, chief engineer, Volkswagenwerk, Wolfsburg, Germany. Mr. Boehner stated that the use of such very light material as magnesium contributed greatly to the success of that light and economical car. Because a rear engine car requires weight distribution for good steering control and directional stability, the engine must be light. The engine itself on that car weighs 170 lb and the weight of the entire power plant with clutch and transmission housing is 270 lb. A total of 36 lb of magnesium castings are used in the car.

All castings are produced in the company's foundry by approximately 500 men working 3 shifts. Nine induction type furnaces, each of 1300-lb capacity, require 40 minutes melting time. In addition, 36 holding furnaces are used. All engine crankcase halves are cast in permanent molds, and about 12,000 castings are made from a mold before reworking is necessary. Because approximately 70 per cent of the final weight of the casting is in the form of gates and feeders, the company rapidly is converting to pressure die casting. Mr. Boehner stated it took two years to work out difficulties in pressure die casting magnesium chiefly because the machine used was too small for the job.

Pressure die casting machines work on the cold chamber principle and each machine produces about 18 transmission halves per hour. Approximately 1500 complete transmission housings and engine crankcases are produced a day. In conclusion, Mr. Boehner stated that use of magnesium castings by his organization has grown from 332 metric tons in 1949 to 7000 metric tons in 1955. A total of 21,893 metric tons of magnesium castings has been used during that period in 1,170,066 vehicles.

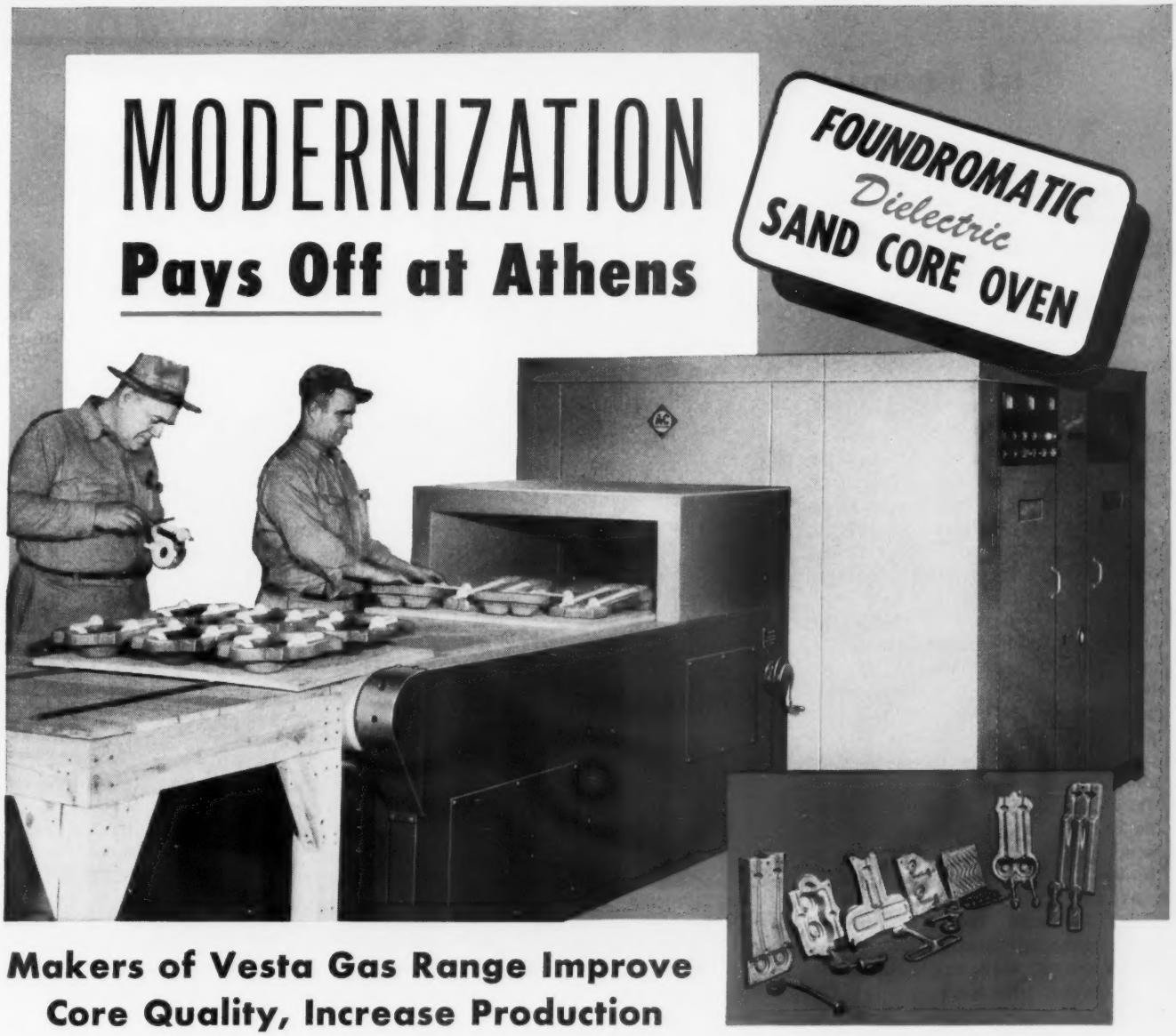
Sherwood H. Egbert, vice president, manufacturing, McCulloch Motors Corp., Los Angeles, described some of the features of the company's magnesium die casting operation. He stated that metal was melted in resistance type electric furnaces. Magnesium is broken down into molten form in a breakdown furnace and is transported in a transfer furnace to a holding furnace located beside the die casting machines. This system provides centralization of ingot storage, delivers hot metal to the casting machine—thus eliminating fluctuation of metal temperature each time an ingot is loaded into the furnace—permits closer control of fluxing should the metal require refinement and gives a constant supply of clean metal.

All scrap castings, butts and runners are accumulated and sent to an outside firm for refinement and realloying. This reclamation service is performed at a cost of 2½ cents per pound of refined metal with an 11 per cent metal loss. Manufacturing space limitations, industrial zoning and smog control factors preclude the possibility of reclaiming scrap at the plant.

Magnesium metal AZ91B is used for all castings. The method of handling varies with the type of castings. In general, large, thin-walled castings require a high-speed, medium-pressure metal injection. Heavy-walled castings or castings with thick bosses require low-speed, high-pressure metal injection. Small magnesium castings pose no particular problem and usually are simple to cast. The over-all rejection rate in the die casting department is a remarkably low average of 4 per cent.

MODERNIZATION
Pays Off at Athens

FOUNDROMATIC *Dielectric* **SAND CORE OVEN**



Makers of Vesta Gas Range Improve Core Quality, Increase Production

Faced with ever-increasing operating costs and stiff competition, the Athens Stove Works of Athens, Tennessee, looked to modernization for the answer. One of the most significant steps taken was the replacement of coke-fired, hand-fed core ovens with a modern *Foundromatic* dielectric sand core oven.

As a result, production has been greatly increased and core quality improved. Operating fully loaded, the belt of the *Foundromatic* oven travels at a highly productive rate of 32 inches per minute. And because cores produced are free of defects, casting finishes are smoother and cleaning time is reduced.

The *Foundromatic* oven has also helped Athens meet a specific operating condition. Cores set up in molds early in the morning are not poured off until the middle of the afternoon. Because the *Foundromatic* oven produces a thorough bake, moisture pick-up is minimized.

The *Foundromatic* Sand Core Oven Can Pay Off for You With:

- Shorter Curing Time
- Less Core Handling
- Smoother Casting Finishes
- Easier Shakeout
- Better Foundry "Housekeeping"
- Lower Fuel Costs
- Fewer Rejects
- Improved Work Flow
- Reduced Cleaning Time

For all the facts on the Foundromatic *dielectric core oven, call your nearby Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wis. Ask for Bulletin 15B7306B.*

Foundromatic is an Allis-Chalmers trademark.

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ACTIVITIES
of Foundry Groups

Oregon: Foundrymen from British Columbia, Washington, Oregon and California convened at the Multnomah Hotel, Portland, Oreg., on Oct. 14-15 for the sixth annual Northwest Regional Conference of the AFS. The convention was welcomed to Portland by the city's mayor, Hon. Fred L. Peterson.

Highlights included luncheon talks by R. W. deWeese, vice president, Electric Steel Foundry Co. and Dr. J. G. Jensen, chairman, Department of Natural Resources, Oregon State College. Bruce L. Simpson, president, National Engineering Co., Chicago, and national AFS president, delivered the banquet address.

M. O. Woodall, Rich Mfg. Co., James W. Smith, Holt Equipment Co., and Bud Banks, chairman, Oregon State College student chapter, AFS, presided at luncheons and the banquet.

A ladies program was arranged, in addition to the banquet and dance. Many delegates and wives attended the University of California and University of Oregon football game on the last night of the conference.

At the Friday morning sessions, Hans J. Heine, technical director, AFS, spoke on "Means Toward Better Castings" with emphasis on design, gating principles and the CO_2 process. Harry Czyzewski, president, Metallurgical Engineers Inc., Portland, and chairman, Oregon chapter, AFS, discussed "Nondestructive Testing and Quality Control." Fred A. Young, E. A. Wilcox, Seattle, Wash., served as chairman.

Friday afternoon a session on "Principles of Molding and Sand Technology" was held with A. A. Belusko, sand technician, Electric Steel Foundry Co., as chairman. Speakers were Clyde A. Sanders, American Colloid Co., O. Jay Myers, Archer-Daniels-Midland Co., and Hans J. Heine.

Saturday morning Mr. Sanders spoke on "Scrap Diagnosis, Its Causes and Cures." S. J. Hatchett, Canada Metal Co., Ltd., served as chairman. Technical sessions closed with Palmer Ford, Kaiser Aluminum & Chemical Sales Inc., and C. E. Grigsby, General Refractories Co., speaking on "Basic Refractories" and "Electric Furnace Refractories." Curt Graverson, Precision Cast Parts Co., Portland, was chairman. — *Norman E. Hall and Bill Walkins, Electric Steel Foundry Co.*

Reading: Three technical workshops were held in the Berkshire Hotel, Reading, Pa., as the Reading Foundrymen's Association held its first meeting of the new year. Robert A. Colton, Federated Metals Division, American Smelting and Refining Co., Newark, N. J., addressed the brass, bronze and aluminum group. S. J. Buzash, Foundry Division, DeLaval Steam Turbine Co., Trenton, N. J., spoke to the iron group and John J. Csaklos, Crucible Steel Casting Co., Lansdowne, Pa., talked to the steel group.

Paul K. Reiniger, association president, announced that a technical sand school will be conducted at the Wyomissing Polytechnic Institute, March 12-14. Instructor will be Victor Rowell, Harry W. Dietert Co., Detroit.—*W. I. Cassidy.*

Wisconsin: At its Oct. 14 meeting at Hotel Schroeder, Milwaukee, the AFS chapter departed from usual custom and joined in a combined meeting to hear Richard W. Heine, associate professor, metallurgical engineering, University of Wisconsin, talk on "Molding Sands, Molding Methods and Casting Dimensions."

Prof. Heine illustrated his talk with numerous charts and slides. He stated that users of castings are demanding quality with greater accuracy both in dimensions and weight. He described the character of molding sands and the condition of molding equipment necessary to satisfy these customer demands.

Harry Czarneki, Industrial Commission, Wisconsin, announced that the annual AFS contest for apprentices in wood patternmaking, metal patternmaking, steel, iron and nonferrous molding was open to all registered foundry apprentices in the state. Wisconsin chapter will award prizes in all divisions, and first three award winners in each division will

NORTHWEST REGIONAL Foundry Conference was held in Portland, Oreg., on Oct. 14-15. Some of the participants are shown here. Left to right are A. A. Belusko, Electric Steel Foundry Co., session chairman; O. Jay Myers, Archer-Daniels-Midland Co.; Hans J. Heine, technical director, AFS, and Clyde Sanders, American Colloid Co. Center view, left to right, are James Dorigan, conference chairman; Fred A. Young, E. A. Wilcox Co., session chairman; Mr. Heine, and Harry Czyzewski, Metallurgical Engineers Inc. At far right is Bruce Simpson, National Engineering Co., Chicago, national president of AFS, shown addressing the delegates at the banquet. Photos by W. Walkins, Electric Steel Foundry Co.

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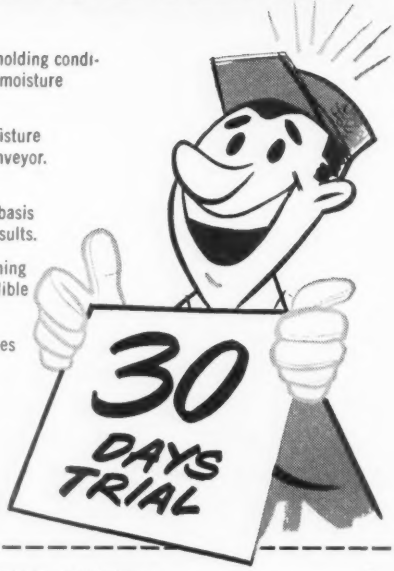

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qualify for the national contest. First-place winners in the national contest receive trips to the national convention of the AFS at Atlantic City, May 3-9.—*John E. Hubel.*

Pittsburgh: More than 150 members of Pittsburgh Foundrymen's Association met Oct. 17 at Webster Hall Hotel, Pittsburgh, to hear Roy J. Carver, general manager, Carver Foundry Products Co., Muscatine, Iowa, speak on "CO_2 Mold and Core Hardening Process."

A petition signed by 11 member companies requesting dissolution of the PFA and merger with the AFS was read. Ballots have been mailed to members for a vote on the question. PFA has been an independent group since 1896. The question of merger has been debated for several years.

Mr. Carver demonstrated the CO_2 process and showed sample cores. He discussed the usual mistakes made by beginners using the process. First essential, he pointed out, is good apparatus, consisting of a source of gas, a hose and coupler. He explained that cores are highly precise and as they are made cold there is no need for cooling or danger of warping.

"One of the most frequent mistakes made by users of the process is getting a sand with high percentage of fines and clay," continued the speaker. In conclusion, he added that cores will shake out easily by following correct procedures, despite some reports to the contrary.—*Robert O. Love.*

Saginaw Valley: The AFS chapter met Oct. 6 at Fischer's Hotel, Frankenmuth, Mich., to hear Dr. Mead L. Killiom consulting psychologist, Rohrer, Hibler & Replogle Co., discuss "The Normal Personality." Dr. Killiom defined the normal personality and discussed the broad aspects of personality development described as self esteem, self insight and self realization.

Woodrow W. Holden, retiring chairman, was presented with a plaque in recognition of his services to the chapter. F. P. Strieter, Dow Chemical Co., chapter chairman, made the presentation.—*R. G. Brown, Dow Chemical Co.*

Southern California: An afternoon and evening casting clinic featured the Oct. 7 meeting of the AFS chapter at Rodger Young Auditorium, Los Angeles. Bruce Simpson, AFS president, and Hans J. Heine, AFS technical director, attended the meeting and Mr. Heine moderated the general program. Frank Brewster, Brumley-Donaldson Co., and Charles

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Locke, Westlectric Steel Castings Co., led the discussion of casting defects. Program concluded by showing the AFS film, "Study of Vertical Gating Design."—*Edwin J. Worth, Howell Foundry Co.*

Ontario: Introduction of ten new members, presentation of awards to winners in a paper writing contest and two talks featured the Oct. 28 meeting of the AFS chapter at Royal York Hotel, Toronto, Ont. P. J. Provias, chairman, education committee, and W. Bryce, chapter chairman, presented cash awards to J. Morgan, Foundry Services Ltd., O. R. Scott, International Malleable Co., and J. H. Baird, Aluminum Co. of Canada, for the best entries in a chapter contest. All wrote on nonferrous subjects.

Walter Jaeschke, Whiting Corp., Harvey, Ill., discussed "Practical Considerations in Cupola and Air Furnace Practice." Pyrometric cone equivalents, high-temperature load test, spalling and practical considerations on causes of furnace bottom failure were covered at some length. Mr. Jaeschke was introduced by W. E. Kinread, Whiting Corp. Ltd., Hamilton, Ont.

L. D. Pridmore, International Molding Machine Co., LaGrange Park, Ill., was the other technical speaker. "Core and Mold Blowing" was his subject, and extensive coverage was given to successful techniques used to blow cores. Cleanliness of machine, venting of loose pieces in corebox and placing of blow holes on prints where possible was stressed. J. H. King, Archer-Daniels-Midland Co., introduced the speaker.—*C. L. Warden, Canadian General Electric Co.*

Birmingham: Top Management Night attracted some 200 members and guests of the AFS chapter to the Dinkler-Tutwiler Hotel, Birminigham, on Oct. 21 to hear L. L. Ellis of Booz, Allen & Hamilton, Chicago, discuss "The Management Task In a Competitive Economy."

Mr. Ellis dealt with the executive's position in industry. He pointed out that too many executives are handling operating details instead of providing over-all guidance, direction and policy formulation. In an after-dinner coffee talk, J. F. Drenning, chapter vice chairman, outlined the program for the rest of the year.—*A. B. Schwartzkopf, U. S. Pipe & Foundry Co.*

Western Michigan: Bill Sterns Steak House, Muskegon, Mich., was the scene of the Oct. 3 meeting of the AFS chapter. Henry A. Laforet, Lakey Foundry Co., chapter vice

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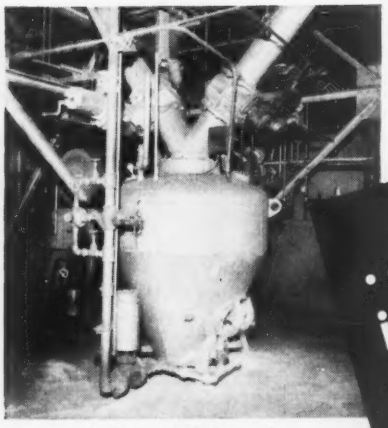

Robinson Activator under two storage bins . .

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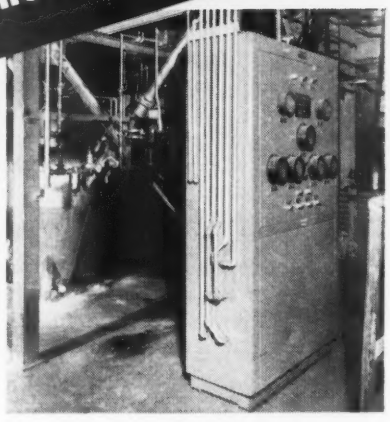

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chairman, presided. Ralph L. Lee was the guest speaker and provided an interesting talk on "The Metallurgy of Human Beings." Mr. Lee is a retired General Motors public relations official and currently is a regular columnist in FOUNDRY.—*Joe Cannon, Muskegon Aluminum Foundry Co.*

Northeastern Ohio: Approximately 200 members and guests of the AFS chapter assembled at Tudor Arms Hotel, Cleveland, on Oct. 13 to participate in a diversified program. Lewis T. Crosby, Sterling Wheelbarrow Co., chapter chairman, presided at the dinner meeting.

E. Claude Jeter, Ford Motor Co., second vice chairman, announced that the AFS-sponsored National Apprentice Contest was open in five divisions of competition. Local winners will be awarded prizes by the chapter. Entries are to be completed by Jan. 15.

At the nonferrous session, A. H. Hinton, Aluminum Co. of America, served as chairman and introduced Walter E. Sicha, also of Alcoa, who presented some background information relating to the AFS sound-color film, "A Study of Vertical Gating." After showing the film, Mr. Sicha answered questions relative to some of the principles described.

The film is the latest effort by the AFS Light Metals Division research committee and probes into gating procedure for permanent and shell molds. The work was done at Battelle Memorial Institute and, as in previous films, is a study of what happens when water is poured into Lucite molds. Intelligent application of the principles established by the research should provide foundrymen with data to aid them in the consistent production of high quality castings.

Charles Schneider, National Malleable & Steel Castings Co., addressed the ferrous session on "Developing New Ferrous Casting Business." Mr. Schneider warned that in times of good business, foundrymen often are inclined to bury themselves in a hectic production race for the immediate market with little thought to the future. Some planning must be devoted to the future and to building new casting business.

The best way for a foundryman to do this is to present outstanding characteristics of his foundry to prospective casting buyers. This should be in the form of a nontechnical description presented through advertising, personal contact or by movie. It is wise, too, to show engineers what castings will do by demonstrating their advantages over other fabrication methods.

Some of the things National Mal-

leable is doing along these lines were described by Chester Lewis, chief melter, and were portrayed in a motion picture.

Speaker at the patternmakers' meeting was C. W. Forestek, Forestek Plating & Mfg. Co., Cleveland, who discussed "Hard Chrome Plating of Aluminum." He reported that hard chrome coatings acquire some of the characteristics of the metal and have brinells up to 1050, not much below that of diamonds. Chrome has remarkable antigalling properties, prevents sticking and, in thick deposits, gives good anticorrosion properties.

Used as a coating for aluminum coreboxes, popular for light weight, chrome is dissolved molecularly into aluminum and creates a new alloy. Cost is 20 per cent more than that of a steel coating. Problem arises from tendency of sand, particularly in large particles, to abrade the chrome. One solution is to arrange blowholes so that sand does not enter at right angles. This reduces wear, the box lasts 10 to 15 times as long, and it can be replated five or six times. Reduction of air pressure has helped, without creating soft cores.

Difference in expansion rates of aluminum and chrome does not seem to cause fracture of the chrome coating, even when the boxes have been heated to incandescence. Some difficulty occurs at joints of coreboxes, but use of rubber strips has been helpful.—*Kenneth L. Mountain, Robert H. Herrmann and Jack C. Miske*

Pine State: First meeting of the 1955-56 season for the Pine State Foundrymen's Association Inc., was held Oct. 6 at Falmouth Hotel, Portland, Me. Clyde Small, vice president and sales manager, Campbell-Hausfeld Co., spoke on "The Selection and Care of Nonferrous Metal Melting Equipment."

Officers for the new season are: President, James Hamblin, Saco-Lowell Shops, Biddeford, Me.; vice president, Otis Haskell Jr., Androscoggin Foundry Co., Auburn, Me.; secretary, William J. Kemp and treasurer, Harlan Penney, J. W. Penney & Sons Co., Mechanic Fall, Me. Directors are John Morton, Saco-Lowell Shops; A. G. Zeigra, Fayscott Corp., Dexter, Me.; Roy Etheridge, Etheridge Foundry & Machine Co., Portland, and Clyde Lake, Hyde Windlass Co., Bath, Me.

John Orrock, Debevoise-Anderson Co., Boston, is a special director and Raymond Parslow and Rodrigue Bergeron, both of Saco-Lowell Shops, are program chairmen. Annual Christmas party will be held Dec. 8. —*William J. Kemp.*

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Take advantage of these Federated extras. So many foundries do that we are known as Headquarters for Non-Ferrous Foundry Metals and for technical information on foundry problems. We have 13 plants and 23 sales offices across the country. Any of them will be pleased to help you.

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Trouble Shooting

By C. W. AMMEN

Fig. 1—Melting iron in a crucible. Fig. 2—Gating gray iron castings. *A* is pouring basin, *B* sprue, *C* runner, *D* gates. Diam and depth of *A* should be four times diam of *B*. Cross-sectional area of *B* should be 10 per cent larger than that of *C*. *C* should be 10 per cent larger in area than area of combined ingates *D*. Fig. 3—Risers are not always needed

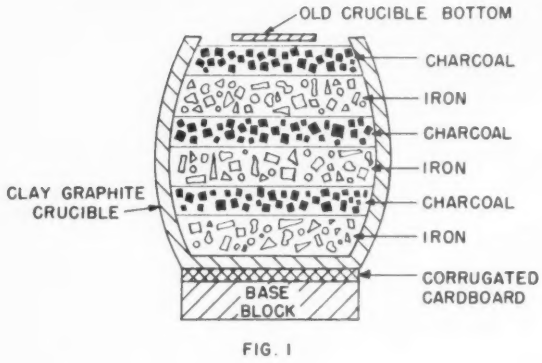

FIG. 1

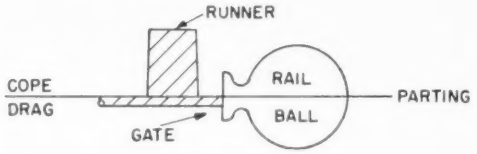

FIG. 3

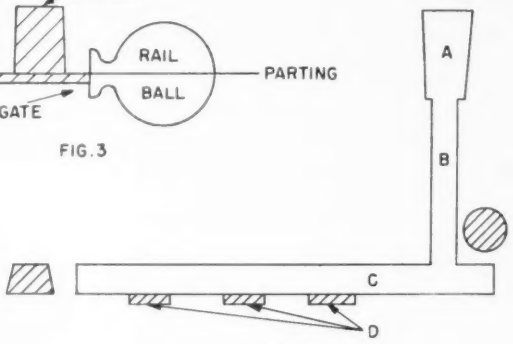

FIG. 2

Melting Iron in a Crucible

Dear Charlie:

Some time ago, before I ventured into the business for myself, I worked for a medium-sized brass shop. Every so often, the boys made a few iron castings by melting the iron in a pit-type furnace in a small crucible, and the castings looked OK to me at the time. On occasion we also wish to produce a few iron castings, both for sale and for our own use. Some time back we built a small cupola, but this adventure did not fare so well. Aside from the length of time required to get the cupola started to produce the small amount of iron we needed, the project did not work out costwise. About the time we got the stack going strong, we didn't need any more iron.

We have a regular customer for rail balls in both aluminum and brass with an order for about 200 a month in gray iron. When we send the only matchplate out to an iron foundry, we wait until it gets good and ready to make the castings, and this time delay has caused us friction with our customer. We have considered a second plate, but we might still wait. We also have considered buying a big gang of iron balls at a time, but we can't anticipate customer's use of them.

Would appreciate a little information on how it's done, how to gate gray iron and what to do to the sand. I'm given to understand that crucible melting of cast iron is excessively costly and that it's hard to get the metal hot enough.

Sincerely,
Sam

Dear Sam:

You are so right, Sam. Unless you have enough iron to pour to justify your bed-coke, time, etc., you can't make out with a cupola, no matter how small it is.

The melting of gray iron in a crucible actually is so simple that it's a wonder it is not more general. A foundry in my neighborhood produces small gray iron castings from eight small pit-type gas-fired crucible furnaces and has done so for many years. It's a nice clean operation, and I suppose the company is making money, or it would shut down.

The usual practice is to use clay graphite crucibles, say #60's or 70's. The iron should be free from dirt, sand, rust, aluminum, copper, etc., and broken up into small pieces the size of walnuts or a little larger. The crucible is charged with alternate layers of small charcoal and iron to which has been added about two handfuls of soda ash—not fused soda ash. The soda ash can, if desired, be placed on the bottom or the top of the charge.

Cover the crucible with an old crucible bottom and place a circular piece of corrugated cardboard between the crucible and the base block to prevent the crucible from sticking down. After the first heat, the new cardboards will have to be wetted before being put in place. Seacoal sometimes is used for a parting but nothing else seems to beat the cardboard.

Next, just kick her off with the flame slightly oxidizing. Gray iron melts at about 2327°F, and although this figure may look high compared with the melting point of brass, you will find that with layers of charcoal between the iron, rapid melting can be done in very little longer time than it takes for brass. With a little practice, you can produce iron castings of a high grade.

As you get a little experience in melting iron in a crucible, you will be able to tell at what time the heat is hot enough to run the castings, etc., and by variations of metal charges—scrap, pig and steel scrap —you will be able to come up with what suits you and the job best.

The cost is not excessive, as you might think it would be. Small iron castings usually carry a high enough price to come out on OK. You shouldn't sell any type of castings by the pound, anyway, like bananas or onions. I have produced these rail balls and also picket points in iron. Both weighed about 1 lb each, and we used to get 25 cents each for them in small quantities, such as the 200 or so you speak of. That was when iron was 4 cents a pound at the spout; so I don't see how you could lose by this method. Keep some cost figures on your iron operation, and you will be surprised at how cheap it really is. It is

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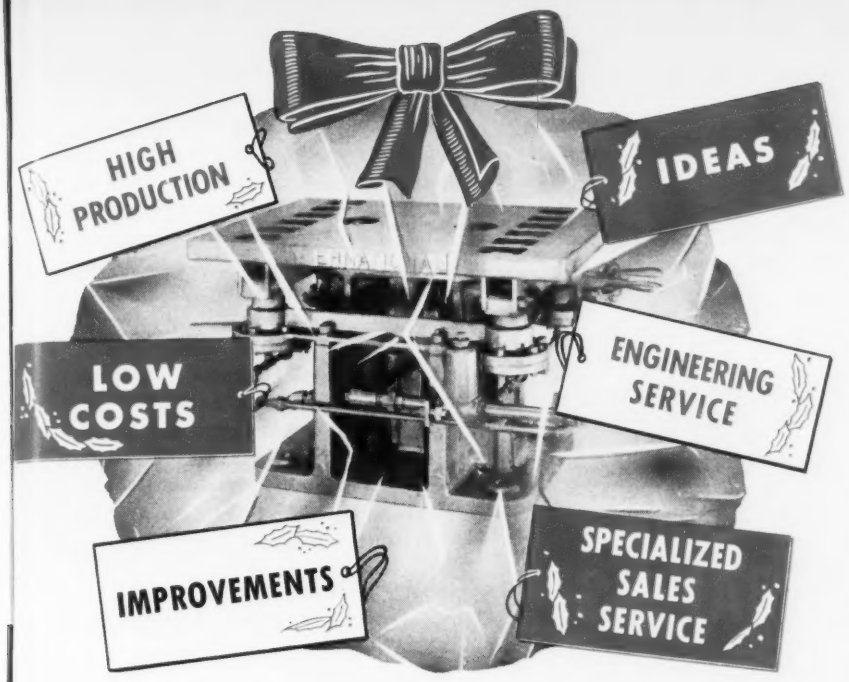

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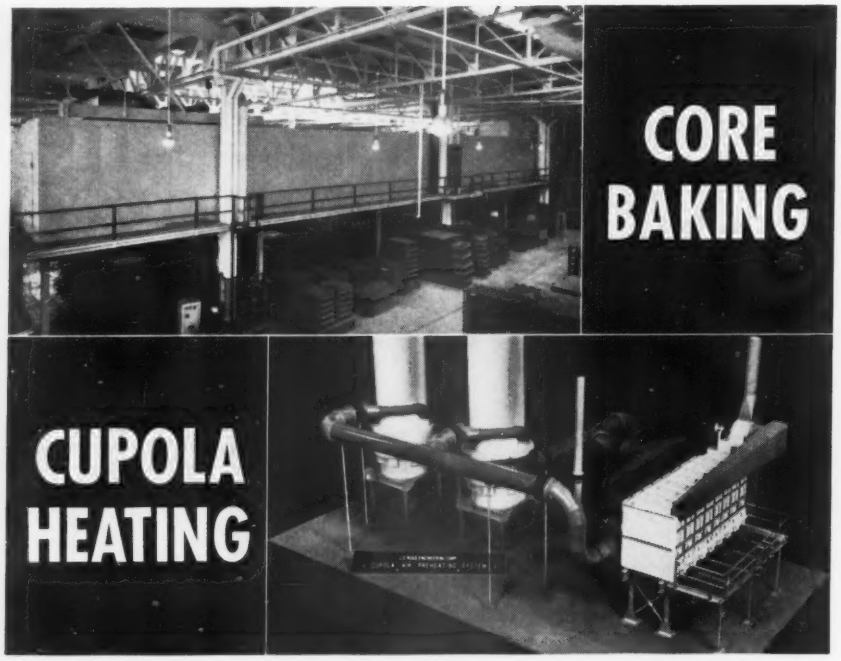

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simple, easy, cheap, clean and pretty near foolproof, so don't have any qualms about melting iron in crucibles. It's easy.

There really are no hard and fast rules, Sam, about gating gray iron or anything else. The right way to gate a casting is any way which yields a good, clean, sound casting with a minimum amount of metal in the gating system and with easily removable gates. I know a fellow who gates everything backward as far as the rules go and produces some of the finest castings you ever saw. Researchers recommend as a general rule the sizes shown in Fig. 2.

How To Gate Gray Iron

The pouring basin should be four times as deep as the diameter of the downgate and also four times as big in diameter. The downgate should be approximately 10 per cent larger in area than the runner bar, which in turn should be 10 per cent larger in cross-section than the combined area of all the ingates. Although these dimensions are supposed to be the ideal, I have seen practically no gating systems which come anywhere near fitting this ratio.

In most cases a foundryman first tries to crowd as many castings as possible into a flask and then uses the remaining area to squeeze in the runners, gates, etc. And don't we all? Some day I'm going to break down and try this ratio business myself. All joking aside, Sam, regardless of the ratio, the system must be properly proportioned so that the metal fills the mold quietly and fast enough and slag is prevented from entering the cavities. The pouring basin must be such that it will not suck the metal and slag in.

Choke the metal into the gating system, don't construct your gate system so that it will produce hot spots, and provide enough ingates. Gate into risers wherever possible, don't gate against a core, gate so that the metal will rise around cores, fillet all corners, have no sharp edges, use proper sprues, use mounted gates or set gates in preference to gates cut by hand, and by all means take as much pain and care with the entire gating system as you do with the entire mold cavity.

In risering gray iron, just remember that the purpose is the same as in nonferrous practice—to provide hot liquid feed metal. The size of riser needed varies, of course, in accordance with the class of iron pro-

duced, the metal section and the design of the castings. Generally speaking, the need for risers in iron is somewhat less than in the red metal field. Iron, because of how it solidifies, rarely produces a shrink void which has no direct connection to the external surface of the casting, like those produced in, say, manganese bronze. Shrinkage usually shows up on the cope surface as a depression or around the edge of a boss or in a sharp corner with a cavity directly to the outside.

An internal void in iron which is smooth and with no connection to the outside surface is most likely the result of gas or an internal explosion. It often is not necessary to riser small gray iron castings mounted on matchplates—items like your rail balls, for example. A deep enough cope and a runner bar just a shade taller than the highest point on the castings usually is enough to hold up the castings, as shown in Fig. 3.

Recommends Proper Risering

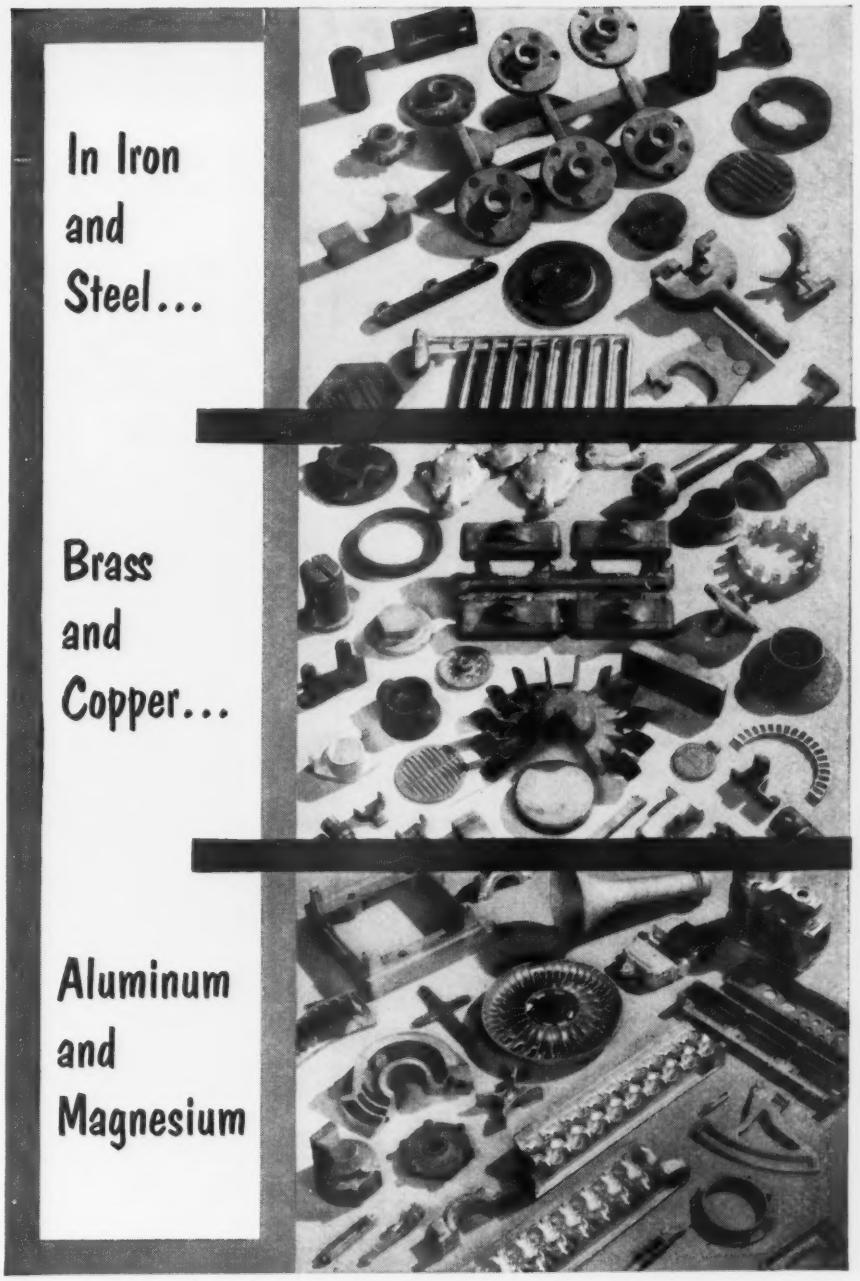
Use round, blind risers if possible and gate into the riser, giving it the last hot metal. Avoid over-risering. Thousands of castings are made with unnecessarily large risers on them; some need none whatsoever. If a riser is not placed in the correct position, it will, of course, often defeat the purpose for which it is intended.

I once ran across a plate (in a shop) which had been used to produce castings for 20 years. It was two cast iron rings ¾-in. thick, with 8-in. OD and 7-in. ID. The sprue was cut between the two rings, directly opposite the ingates, and a large riser had been placed on each ring. When I asked why the risers were used, the explanation was that they were to feed the rings. Looking at the tops of the risers, I could see the shrinkage caused where they fed the rings. How about that? I removed the risers and I guess the shop still is making those rings today without them.

In a case like this, the riser simply becomes an additional piece of the casting produced and serves no purpose; additional metal is required per mold, and the riser must be removed.

Should you have to use a riser, place it as close to the casting as possible, keeping the neck large enough to remain open and gate into the riser. As with the gating, take as much pains with your risers as you would with the cavity itself.

If you have many castings to



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Each of these photos is a mere sampling of castings produced from shell molds bonded with Durez resins. They suggest not only the scope of the new method, but also our broad experience in helping foundries to get the best results with these resins.

You are invited to call freely on our extensive practical knowledge, and to receive — if you do not already have one — the most useful book on shell molding published to date. Write for our 36-page illustrated "Durez Guide to Shell Molding."

DUREZ PLASTICS DIVISION
HOOKER ELECTROCHEMICAL COMPANY
1012 WALCK ROAD, NORTH TONAWANDA, N. Y.

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PHENOLIC RESINS
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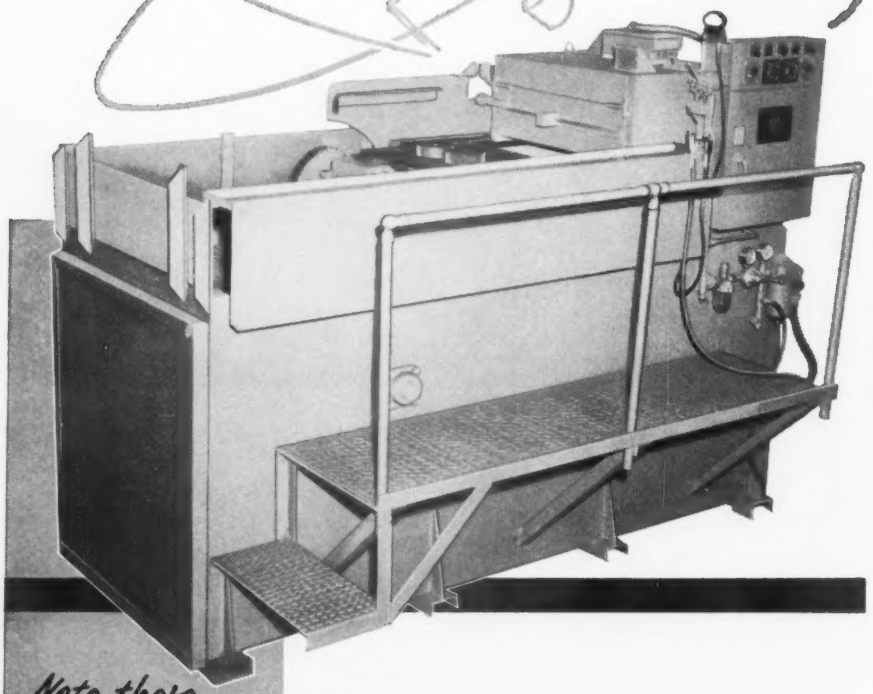
- PROTECTIVE COATING RESINS

SHELL MOLD RESINS THAT FIT THE JOB

Precision Shell Molds

In less than 70 Seconds

at the push of a button!



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- Infra-red radiant heat curing oven
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- 700 lb. sand capacity

Increase your foundry production, reduce labor costs, sand handling, metal wastage and machining operations, and put precision shell molding on a *push button* production basis —with the *new* . . .

SHELL-O-MATIC
Automatic Shell Molding Machine

A complete cycle from heating of pattern to inspection of finished precision shell takes *less than 70 seconds* with this fully automatic machine. Unskilled personnel can easily handle its most simple operation and yet produce 50 or more completely cured shells per hour! Pattern changeover is a matter of minutes. Quickly installed—one electrical and one air connection and machine is ready for operation.

Write, wire or phone for complete details showing how SHELL-O-MATIC can reduce costs and increase production in *your* foundry.

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make, a good idea is to gate one where you think it would be best, make a few molds, then examine the castings to determine whether risers are needed and of what size and number if they are necessary at all. You can use your brass sand for gray iron provided that the castings are light enough in section. Sometimes all that is necessary is to make a little 1-to-10 seacoal facing. You also might try these mixes:

Very Light		Light Squeezer	
Moisture	6 to 8%	Moisture	6 to 8%
Perm	10 to 20	Perm	20 to 30
Green comp.	6 to 8 lbs.	Green comp.	6 to 8 lbs.
Fineness	180 to 200	Fineness	80 to 120
Seacoal as needed		Seacoal as needed	

Sincerely,
Charlie

Offers Index and Directory to Fire and Accident Control

An index and directory to fire and accident control codes, standards and references has been compiled by Loss Control Associates, 629 Oakmont Drive, Plattsmouth, Neb. The work was developed to provide a fast and reliable source of information on accident prevention, fire control and health and sanitation in nationally recognized codes and standards and reliable references.

It performs three services. 1. It quickly provides the user with exact directions as to where he can find complete information concerning any phase of fire and accident control. 2. It constitutes a guide to the many phases of fire and accident control. Each subject contained in the index is broken down into subtopics, and both are cross-referenced. 3. A complete directory of publications referenced in the work is included. Price and procurement address of each is indicated.

To keep the index and directory up-to-date, a supplement will be issued every six months.

Revise Apprenticeship Booklet

An amplified third edition of the booklet "Apprenticeship Past and Present" has been issued by the Bureau of Apprenticeship, U. S. Department of Labor. It compares past and present training procedures in this country since the earliest examples. Single copies of the new edition can be obtained for 20 cents each from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A 25-per-cent discount is given on orders for 100 or more copies.

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Milwaukee Solvay quality begins with the careful selection of the coal which is purchased for one purpose only—to make best coke.

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IRON ORE PIG IRON COAL COKE

Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"The Romance of Sand"

FOUNDRYMEN are for the most part a prosaic lot and probably spend little time contemplating the beauty of poetry, literature, statuary or even fine music. On second thought, I'm probably wrong about music, for this has been termed the universal language, and a man would be poor indeed who had no music in his soul.

I am quite willing to admit that a successful foundryman probably has little time or inclination to devote to the contemplation of fine art. The business of making castings for profit, if it can be considered an art at all, must be listed as a useful or vulgar art. The shoveling and ramming of sand, the charging and tapping of a cupola, the chipping and grinding of castings, all these seem far removed from everything aesthetic.

It must be difficult for the average man to associate a foundry with poetry and music mentally. Yet it is all there if only we are capable of recognizing it. If the seeming jangle of noise from a city street can be translated into a musical symphony, then surely the foundry should hold greater inspiration for the composer of melody and drama, for there is undoubtedly a wealth of romance in it all.

I remember a picture which appeared several years ago in an advertisement in FOUNDRY. A clear-cut grain of silica sand was shown resting alone in a velvet-lined jewel box. I have forgotten the wording that described it, but it was something to the effect that our entire civilization rested on such little grains of silica sand. At first glance, such a statement seems preposterous, but only a little thought is required to arrive at a realization of its probable truth.

After all, silica sand, or a sand containing a high proportion of silica.

MELTRITE PIG IRON

More Meltrite is used than any other merchant pig iron. It comes from five plants favorably located to serve the needs of industrial America.

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IRON ORE PIG IRON COAL COKE

has been a basic necessity to the foundry industry since its very inception. Upward of 90 per cent of all the castings made in iron, steel, brass, bronze, aluminum, magnesium, etc., since the very beginning of our industry, have been sand-molded.

The importance of iron, steel, and nonferrous castings is quite likely to be underestimated by the greater part of the human family. Even those who rank high in industrial education are prone to consider castings in a perfunctory sense. How few of us have even paused long enough to meditate seriously on the possibility of a world without castings?

Eyebrows have been raised on several occasions when your old sandman has insisted that "Civilization as we know it would cease to exist if the casting industry were not permitted to function." Yet, is that statement preposterous? Could there be any equipment powered by steam, electricity, oil, gasoline, etc., without the aid of castings somewhere along the line?

Look about you at all of the modern conveniences you now enjoy—not only your automobile and many home appliances, but the countless other things, clothes, furniture, paint, glass, paper and specially packaged foods. All are produced by machinery that was born, if not conceived, in a foundry. Without castings, we would revert to the primitive stage symbolized by the wooden plow, the ox and the peasant.

If castings are necessary to our way of life, then surely the sand which makes them possible is primarily important. Not only does glass-making machinery stem from the sand-mold, but the glass itself is sand that has been transformed through heat. Since the very dawn of history, sand has influenced the affairs of man in no small degree. He first learned to measure time with it in his crude hourglass, and nearly all of his building program depended on it, even the pyramids.

Molding Sand Is Available

My interest in the romance of sand is solely concerned, however, with foundry practice through the ages. It seems as though wherever man found it expedient to settle in large numbers and build a new life for himself, Providence had conveniently provided a deposit of molding sand suitable to his needs.

Of course there are exceptions to the rule, but from Istanbul to San Francisco, moldable sand seems to have been deposited purposely at the very points where man was to need it most. I may be guilty of fallacious reasoning (which is not unusual for me), but it seems to be something more than mere coincidence that the world's first and still greatest statuary molders in Italy, France and Belgium should have found precisely the sand they needed right in their own backyard. And I am told that even today there is no better sand for that purpose.

The English foundries always have had a goodly choice of foundry sand immediately available. The great American foundry centers east of the Mississippi probably enjoy an inexhaustible supply of the best and cheapest foundry sand in the world, and it is significant to note that these districts lead the world in casting production.

Here on the west coast, it seems to me that we also have been fortunate in our sand supplies. During the 1860's, prior to the completion of the Central Pacific railroad (now the Southern Pacific), there were more foundries in San Francisco than there are today. The city literally rests on a bed of very serviceable natural-

MORE FOUNDRY PRODUCTION by

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OVENgineering*

* Ovens engineered to fit production need will result in more production and more foundry profits. This belief is supported by an ever increasing number of forward looking metalworking companies and foundries as they keep cost checks on Despatch "Ovengineering".

For 52 years Despatch has been designing, building and installing foundry ovens for the nation's leading foundries. They have developed many features and designs to speed baking of cores, to improve core quality, make better use of labor, to fit ovens in difficult floor space. In fact Despatch has developed "Ovengineering" to a science that will put new profits in core making in your foundry. Let us send you a copy of our Foundry Bulletin No. 31 or have a field engineer visit. He will tell you how Despatch Ovengineering will assist you in your foundry.

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Minneapolis Office: 619 S. E. 8th St.
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DESPATCH OVEN COMPANY

ly-bonded molding sand, and the basement excavations provided the newly arrived foundryman with a molding material that served him well.

So enthusiastic did he become that he actually was building locomotives here some time before the railroad arrived. The foundry industry rose and fell with mining, lumbering, etc., each time exceeding its previous level on the upward climb. New industries continued to make greater demands for castings, and new sand deposits were explored and exploited.

From San Diego to the Canadian border, sand of varied description has been and is being unearthed and made to serve better both old and new requirements. With various types of beach sand on this long Pacific shore, and with desert sand along the Nevada line, it would seem that Providence has been indeed kind to us. But in addition to these deposits, we also have the great piles of quartz sand and rock along the Mother Lode, from which the gold seekers extracted their wealth. Some of this material now is being conditioned for foundry use.

The transition from naturally-bonded to synthetic (formulated) practice is being accomplished here quite painlessly.

From the cradle to the grave, man makes much more than footprints in sand, and despite his triumphs with bells, cannon and statues during this first millennium, amazing chapters are yet to be written in this romance of foundry sand.

Foremen Often Lack Authority To Carry Out Assignments

Many companies expect more from their foremen than they are willing to let them do, according to a study by the American Management Association Supervisory Development Service. First-line supervisors frequently are not given authority commensurate with their responsibility. In consequence, many foremen are under pressure to get results without having the power to enforce their decisions.

The survey sample included 66 companies, among which were 56 manufacturing firms, 7 utilities and 3 petroleum and food processors. Size ranged from 100 to 116,000 employees.

More than 90 per cent of the respondents said their first-line supervisors were responsible, for example, for job training, answering employees' questions and meeting periodically with immediate supervisors to discuss problems. Yet the author-

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PERFECT CONTROL

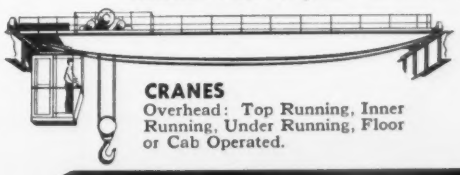
for every load you lift . . .

LIGHT LOAD OR HEAVY, your load is under complete control when you handle it with a Shepard Niles Crane. The Magnetic Control system puts reliable lifting power . . . smooth, safe overhead travel . . . and precision spotting at your fingertips. No wonder cranes bearing the Shepard Niles name serve so many American plants.

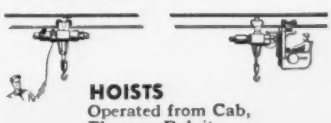
All component parts in Shepard Niles Cranes are designed and built by Shepard Niles especially for crane service . . . your assurance of extra years of dependable, trouble-free operation. Light, medium and heavy-duty cranes are offered for the work your service demands. Available in slow, medium and high speeds . . . floor, cab or pulpit operated.

Send for latest Crane Bulletin or request a Shepard Niles representative to call and talk over your plant's handling needs. He's well qualified to recommend the crane that meets your requirements.

America's Most Complete Line of Cranes and Hoists since 1903



CRANES
Overhead: Top Running, Inner Running, Under Running, Floor or Cab Operated.



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Operated from Cab, Floor or Pulpit.

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★ ★ ★ These superior PATTERNS are produced under the personal supervision of the two owners and a highly skilled group of employees.

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Wood and Metal Patterns

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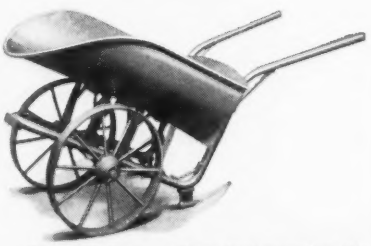
FORWARD DUMP BARROWS for FOUNDRIES

No. 102-A Barrow. Single steel wheel with 2" face, 16" diameter and 12 spokes.



No. 113-A Barrow. Two steel wheels with 2" face, 18" diameter and 10 spokes.

Here are two well-balanced charging Wheelbarrows for heavy duty foundry service. Handle loads up to 1000 lbs. Sturdy, welded, all-steel construction. Single wheel or double wheel. Available with zero pressure cushion type wheels or 4 ply pneumatic tired wheels with roller bearings. Immediate shipment.

Write for Circular No. 58.

Sterling FOUNDRY EQUIPMENT

STERLING WHEELBARROW COMPANY . MILWAUKEE 14, WIS., U. S. A.

A 5792-1½

ity given to foremen in the whole area of human relations is surprisingly small. The same condition applies to such other areas as demotion and promotion, merit increases, helping employees with personal problems, work planning and safety.

The complete report of the groups' survey appears in the September issue of *Supervisory Development Today*. Copies are available only to subscribers, but additional information may be obtained from the director, Supervisory Development Services, American Management Association, 330 West 42nd St., New York 36.

Instrument Society Elects Four National Officers

Delegates representing members of 78 local sections of the Instrument Society of America elected four new national officers at the 10th annual Instrument-Automation Conference, held in Los Angeles Sept. 12-16. More than 14,000 persons attended the meeting, at which over 350 manufacturers exhibited new instruments and components.

Elected president was Robert T. Sheen, president, Milton Roy Co., Philadelphia. Richard N. Pond, Taylor Instrument Cos., Rochester, N. Y., was elected vice president in charge of the society's technical committees. New vice president in charge of the Recommended Practices Division, which consists of 23 subcommittees, is J. Ward Percy, U. S. Steel Corp., Kearny, N. J. Dr. William G. Brombacher, Chevy Chase, Md., retired from the National Bureau of Standards which he now serves as a special consultant, was elected secretary.

Serving second-year terms are William H. Fortney, Humble Oil Co., Houston, Tex., first vice president; A. A. Anderson, Swissomatic Products Co., Santa Monica, Calif., vice president; and J. T. Vollbrecht, Energy Control Corp., New York, treasurer.

ASTM Publishes Year Book

American Society for Testing Materials, 1916 Race St., Philadelphia 3, just has published its *ASTM Year Book* for 1955. Containing over 600 pages, the book lists names and addresses of the society's more than 8000 members. In addition it gives the membership of the organization's more than 100 technical and other committees as well as the names of officers, directors and administrative staff. Information and data pertaining to the society also are presented.

Metallurgical Awards Made At National Metal Congress

Various awards for outstanding contributions to the field of metallurgy were made during the 37th National Metal Congress and Exposition held in Philadelphia, Oct. 17-21.

Gold Medal of the American Society for Metals was presented to Alfred L. Boegehold, assistant to the vice president in charge of the Research Laboratories Division, General Motors Corp., Detroit. It recognizes his "great versatility in applying science to the metal industry." Among the contributions cited is the development of pearlitic malleable iron for heavy-section castings such as crankshafts.

The ASM Albert Sauveur Achievement Award went to Dr. William J. Kroll, primarily for his pioneering work on malleable titanium.

Roger W. Straus, chairman, American Smelting & Refining Co., was recipient of the ASM Medal for the Advancement of Research. Kenneth E. Rose, professor of metallurgical engineering and chairman of the department at the University of Kansas, received the ASM $2000 metallurgy teaching award.

The Society of Nondestructive Testing presented its A. V. deForest Award to Ray McBrian, engineer of standards and research, Denver & Rio Grande Western Railway, for his pioneering work in the application of nondestructive testing methods.

Campbell Memorial Lecture of the ASM was given by Robert H. Aborn, director of the Fundamental Research Laboratory, U. S. Steel Corp., Kearny, N. J. His subject was "Low-Carbon Martensites."

New officers installed at the ASM annual meeting include: President, A. O. Schaefer, vice president, the Midvale Co., Philadelphia; vice president, D. S. Clark, professor of mechanical engineering, California Institute of Technology, Pasadena, Calif.; treasurer, C. H. Lorig, technical director, Battelle Memorial Institute, Columbus, O.

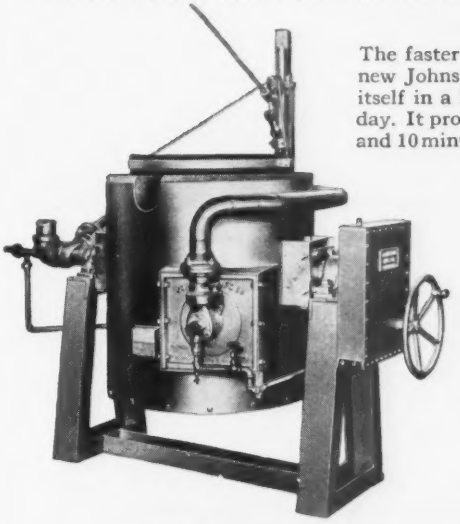
About 35 castings producers were among the more than 400 firms exhibiting at the Metal Show in the Philadelphia Convention Halls during the week.

Statistical Abstract Is Ready

The 1955 edition of the *Statistical Abstract of the United States* has been published and is available at U. S. Department of Commerce field offices. Published annually since 1878, it brings together in its over 1000 pages those statistics which are most

CRUCIBLE FURNACE

Melts 1200 Lbs. of Brass IN 1 Hour, 10 Minutes!



The faster the furnace—the lower your cost. The new Johnston No. 400 Crucible Furnace pays for itself in a hurry by hustling more heats into every day. It produces 1200 lbs. of molten brass in 1 hour and 10 minutes on successive heats, gas fired (may also be oil fired as is model shown). Johnston burners, blowers and experienced engineering combine to produce unusual speed with economically low fuel consumption.

A new enclosed tilting mechanism makes tilting easier than ever before and it may be electrically driven.

Crucible life and lining life are extremely good. Trunnions are adjustable for best balance and are supported on large pillow block bearings. A simple, convenient cover lifting mechanism is operated from the front of the furnace.

WRITE FOR CATALOG 223F

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SAFETY THE JOHNSTON LINE DEPENDABILITY

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2825 EAST HENNEPIN AVE.
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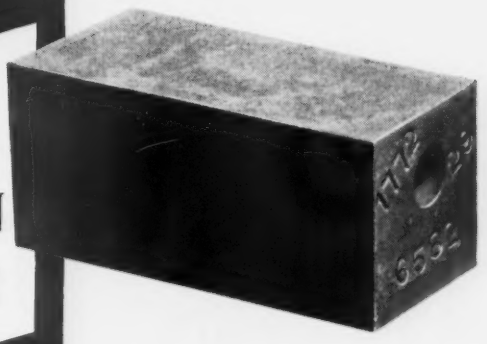
ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

THIS $4.70 BLOCK CAN SHOW YOU

HOW TO END SLAG HOLE FAILURES



Why go on tolerating the frequent production stoppages caused by early failures of slag hole blocks in continuous pour cupolas? For only $4.70 you can buy a standard-size CARBOFRAX® silicon carbide block and keep a furnace running without interruptions for 20 hours or more. Sizes available from stock molds to fit any cupola. Order one or two blocks today and compare the service they give you with what you are getting from your present blocks. Write Dept. AA125, Refractories Division, The Carborundum Company, Perth Amboy, New Jersey.

CARBORUNDUM
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When we erected 17 bins for Johns-Mansville Corporation at Fort Worth, one specification was that the bins must show no signs of leakage or dampness after testing with direct impact of water through a standard fire hose nozzle. The bins are used for handling and storing slate granules of various colors for roof coverings.

"The photograph indicates the water resistance of your bin which was tested in a most rigorous manner," wrote L. A. Benton, Johns-Mansville Project Engineer. "The installation has been very satisfactory."

No matter what kind of flowable bulk materials you use, you'll exercise good judgment by selecting our bins. Better ask for our folder, "Bins With the Strength of Pillars."

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SUPER-CONCRETE STAVE STORAGE BINS

COKE WHEN YOU WANT IT

Only Semet-Solvay has 4 coke plants to serve you. There's one in your vicinity. For fast service, for dependable, uniform coke that means "Better Melting" specify Semet-Solvay Foundry Coke.

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useful in answering questions about the physical and economic world we live in.

Metal Treating Institute Meets in Philadelphia

Metal Treating Institute, the trade association of commercial heat treaters, held its annual meeting at Hotel Warwick, Philadelphia, Oct. 14-16.

New officers elected at a business meeting include: President, H. C. Bosworth, Bosworth Steel Treating Co., Detroit; vice president, K. U. Jenks, Lindberg Steel Treating Co., Melrose Park, Ill.; and treasurer, L. G. Field, Greenman Steel Treating Co., Worcester, Mass.

Elected to the board of trustees were A. E. Leidig, Hollywood Heat Treating Co., Los Angeles; Arthur Eklund Jr., Eklund Metal Treating Inc., Loves Park, Ill.; C. G. Anderson, Anderson Steel Treating Co., Detroit; Robert Davis, Perfection Tool & Metal Heat Treating Co., Chicago; A. T. Ridinger, Metallurgical Inc., Minneapolis; C. H. Knerr, Metlab Co., Philadelphia; and C. M. Cook, Cook Heat Treating Co. of Texas, Houston, Tex.

Fred Heinzelman Sr., Fred Heinzelman & Sons, New York, was presented an honorary life membership in the institute in recognition of 22 years of continuous membership and many contributions to the organization.

Simple Step Wins Award

Simple measures sometimes can produce effective results. Faced with the problem of spotty attendance at its supervisory meetings, which were held every fourth Saturday, Union Malleable Mfg. Co., Ashland, O., solved the difficulty simply. Changing the time of the meeting to luncheons on every fourth Tuesday, the company achieved 100 per cent attendance.

For this "contribution to executive skills," Harry L. Horne, personnel director, received an award of merit from the Research Institute of America.

Film Describes Nodular Iron

First motion picture film on properties and applications of nodular iron has been released by International Nickel Co., 67 Wall St., New York, and now is available for use by industry, technical societies and educational institutions. Made in sound and color, the film "Ductile Cast Iron" runs for 15 minutes.

TRADE . . Publications

For More Details Use Reply Card—Page 197

CASTING FACILITIES: Midwest Foundry Division, L. A. Darling Co., Coldwater, Mich. — Illustrated brochure highlights investment and shell mold casting facilities available for production of castings for aircraft, ordnance, machine tool and appliance industries in addition to custom castings for any specific application. Company maintains a staff of designers to interpret casting problems.
For More Details Circle No. 141—Page 197

NONDESTRUCTIVE TESTING: Magnaflux Corp., 7300 West Lawrence Ave., Chicago 31, Ill.—Booklet, "Lower Manufacturing Costs," discusses various uses for testing and indicates how a nondestructive testing program can be instituted in production departments as a cost-saving, money-making tool.
For More Details Circle No. 142—Page 197

NONSHRINK MORTAR: Master Builders Co., 7016 Euclid Ave., Cleveland 3, O.—Folder illustrates procedure for repairing concrete floors with nonshrink mortar designed to produce hard, strong, tough repairs to cracks, holes, ruts and worn areas of concrete floor steps, walks and roadways, indoors or outdoors.
For More Details Circle No. 143—Page 197

pH METER: Photovolt Corp., 95 Madison Ave., New York 16, N. Y.—Bulletin 118 illustrates and describes self-contained, compact, portable pH meter suitable for laboratory, plant and field work. Powered by its own batteries, the unit requires no connection to a power outlet.
For More Details Circle No. 144—Page 197

TRUCK LIFTS: Wayne Pump Co., Industrial Division, Ft. Wayne, Ind.—Form WI-027 contains photographs, specifications and general information on single and two-post industrial truck lifts that are said to speed servicing and repair.
For More Details Circle No. 145—Page 197

ICE MELTER: Revere Chemical Corp., University Center Station, Cleveland 6, O.—Bulletin RL-427 presents features and application hints for an ice and snow melting chemical said to have 30 times the thawing capacity of salt.
For More Details Circle No. 146—Page 197

SCREENING UNIT: National Engineering Co., Machinery Hall Bldg., Chicago 6, Ill.—Specifications, drawings and descriptive data on self-contained screening and separating unit are found in bulletin 525.
For More Details Circle No. 147—Page 197

MATERIALS HANDLING: Kwik-Mix Co., Port Washington, Wis.—Catalog KM429 describes a materials handling truck that can load, lift or haul all types of materials by interchanging hopper, platform and fork lift attachments on a basic unit.
For More Details Circle No. 148—Page 197

EPOXY RESINS: Furane Plastics Inc., 4516 Brazil St., Los Angeles 39, Calif.—Bulletins EP-54-10a and EP-55-61 provide general information on properties, applications and procedures recommended for using four filled epoxy resins for laminating fiberglass tooling, surfacing plywood, hardwood, masonite or metal sheets, bonding glass, metal or wood, and fulfilling mechanical requirements in casting, bonding and coating.
For More Details Circle No. 149—Page 197

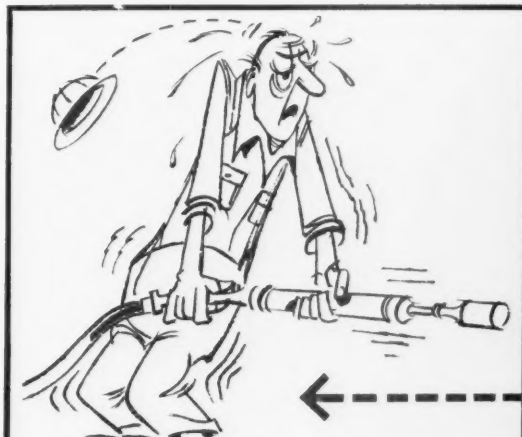
COLOR SLIDES Eastman Kodak Co., Rochester 4, N. Y.—Suggestions for preparation and use of color slide sequences in business and education presentations are embodied in pamphlet, "Notes on Color Slide Sequences as Aids in Business and Education."
For More Details Circle No. 150—Page 197

AC MOTORS: General Electric Co., Schenectady 5, N. Y.—Bulletin GEC-1026 presents buying information on standard alternating current fractional and integral horsepower motors in most general use, including general- and definite-purpose fhp motors and fhp gear motors. Photos, ratings, book prices, dimensions, weights, frame numbers and standard modifications are included.
For More Details Circle No. 151—Page 197

HARDNESS CHART: Tubular Products Division, Babcock & Wilcox Co., Beaver Falls, Pa.—Chart shows approximate relation between hardness by various testing methods and tensile strength of carbon and alloy steels. Hardness systems covered are Brinell, Monotron, Vickers and Rockwell (B, C, and E scales).
For More Details Circle No. 152—Page 197

DRILLING MACHINES: Cincinnati Lathe & Tool Co., Cincinnati 9, O.—Dimensions, specifications, accessories and operational features of 16 in. single and multiple spindle drilling machines are presented in catalog D-134.
For More Details Circle No. 153—Page 197

FERROUS METALLURGY: Tempil Corp., 132 West 22nd St., New York 11, N. Y.—Chart, "Basic Guide



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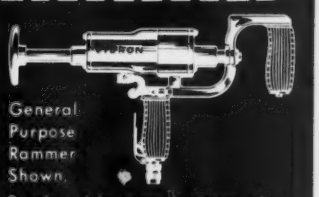

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to Ferrous Metallurgy," provides reference source for principal characteristics of steels across a temperature range to 2900° F. Important working zones shown include stress relieving, normalizing, annealing, forging and preheating for welding. Common metallurgical terms are defined and explained.

For More Details Circle No. 154—Page 197

STACKING BASKET: Wiretex Mfg. Co., 40 Mason St., Bridgeport 5, Conn.—Case history points out how one foundry substituted Inconel baskets and frames for cast iron pots and carriers to reduce number of castings processed during heat treating. Heat treating time was cut 50 per cent, labor costs were lowered by 66 per cent.

For More Details Circle No. 155—Page 197

SANITATION: U. S. Sanitary Specialties Corp., 1001 South California Ave., Chicago 12, Ill.—Pamphlet, "Clean Washrooms—The Key to Good Public Relations," stresses the attractive appearance of the rest room as a major concern of management in relations with the public, whether customers, employees, patrons or others.

For More Details Circle No. 156—Page 197

INDUSTRIAL TRUCKS: Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, O.—Major factors to consider when specifying an industrial truck are detailed in folder. Table lists 22 points to be used for evaluating type of truck most suited to a given operation.

For More Details Circle No. 157—Page 197

MOTOR CONTROL: Cutler-Hammer Inc., 315 North 12th St., Milwaukee 1, Wis.—Bulletin 9801B-1 presents general information on standardized motor control construction to permit control devices to be organized into a complete, enclosed, sectionalized control center.

For More Details Circle No. 158—Page 197

LABORATORY APPARATUS: Eberbach Corp., Ann Arbor, Mich.—Illustrated catalog 55D shows company's line of laboratory equipment featuring shakers, hollow spindle stirrers, electroanalyzers, slide cabinets and other apparatus.

For More Details Circle No. 159—Page 197

HEIGHT GAGE: Greist Mfg. Co., 501 Blake St., New Haven 15, Conn.—Bulletin 105-10 describes a height gage that combines the scribing features of a vernier gage with quick-reading figures to cut reading time, speed layout, measuring and inspection.

For More Details Circle No. 160—Page 197

MATERIALS HANDLING: Cleveland Tramrail Division, Cleveland Crane & Engineering Co., Wickliffe, O.—Booklet 2008-L features engineering and application data on tramrail overhead materials handling equipment. Switches, carriers, tractors, cranes, transfer cranes, gantry cranes, automatic handling systems,

interlocks, discharge points, electrification, buckets and grabs are described and illustrated.
For More Details Circle No. 161—Page 197

PRODUCTION FACILITIES: New Process Gear Corp., 500 Plum St., Syracuse, N. Y.—Booklet details facilities for precision metalworking production. Equipment in the firm's six plants is listed with illustrations of various engineering services available for those who require contract production of close tolerance components or complete units.
For More Details Circle No. 162—Page 197

OPERATORLESS TRACTOR: Barrett-Cravens Co., 628 Dundee Rd., Northbrook, Ill.—Bulletin 552-1 describes and illustrates a completely automatic trackless tractor-trailer system with no operator and no overhead conveyor installation.
For More Details Circle No. 163—Page 197

HAND TRUCKS: Magline Inc., 1900 Mercer St., Pinconning, Mich.—Bulletin HT-101R offers specifications and technical data on commercial light weight magnesium hand trucks and optional accessory equipment.
For More Details Circle No. 164—Page 197

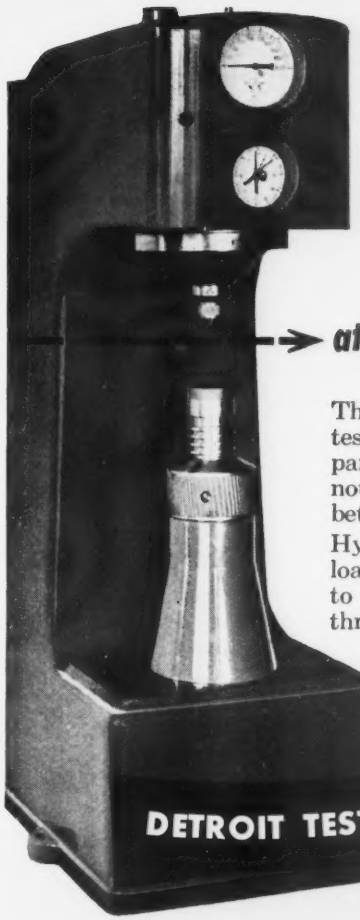
OIL SEAL: Johns-Manville, 22 East 40th St., New York 16, N. Y.—Close-up photographs, detailed drawings, descriptions and documental case histories cover the selection, application and installation of oil seals.
For More Details Circle No. 165—Page 197

FOUNDRY reprints

Push the "Fancy Goods"! by Frank G. Steinebach is a reprint of the editorial in the November FOUNDRY. Message should be of vital interest to foundry management and sales personnel. A limited number are available on a first-come, first-served basis.
For a Free Copy Circle No. 201—Page 197

Automatic Casting of Aluminum Employs Continuous Melting by Jack C. Miske highlights new type aluminum melting furnace that can be heated up in less than three hours, melts ingots in 24 to 30 minutes and provides a continuous supply of metal to an automatic pouring unit mounted on turntables and indexed to a position under the pouring ladles.
For a Free Copy Circle No. 202—Page 197

Test Bars for Copper and Aluminum Base Alloy Castings by Robert A. Colton and Donald A. LaVelle illustrates and discusses test bars and their use as an indication of casting quality. Suggestions are offered for the design of test bar patterns, on producing test bars, pouring practice, heat treatment and testing procedures.
For a Free Copy Circle No. 203—Page 197



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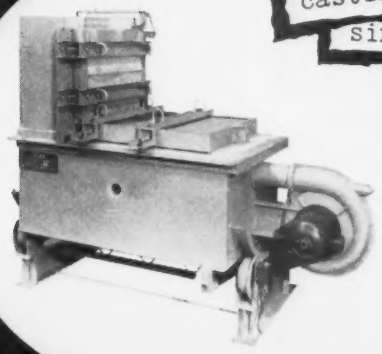

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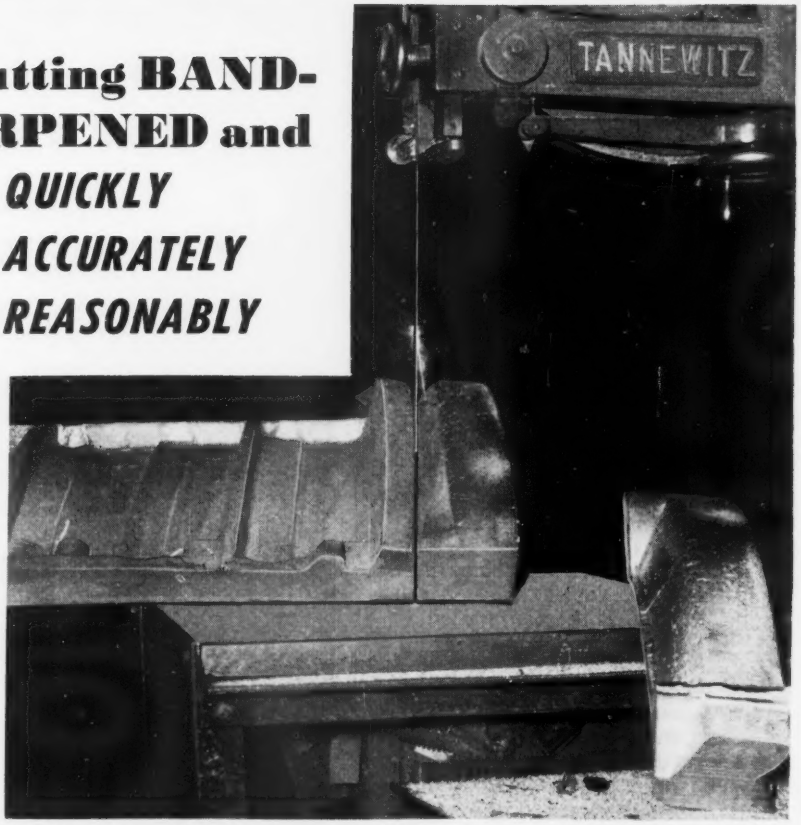

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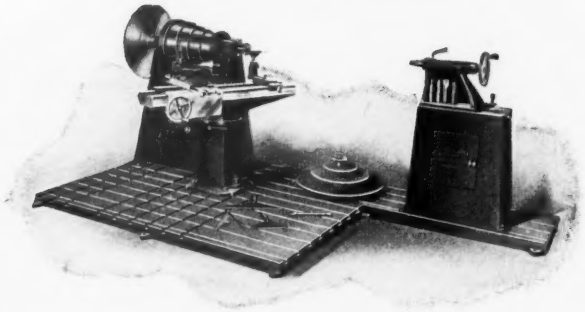

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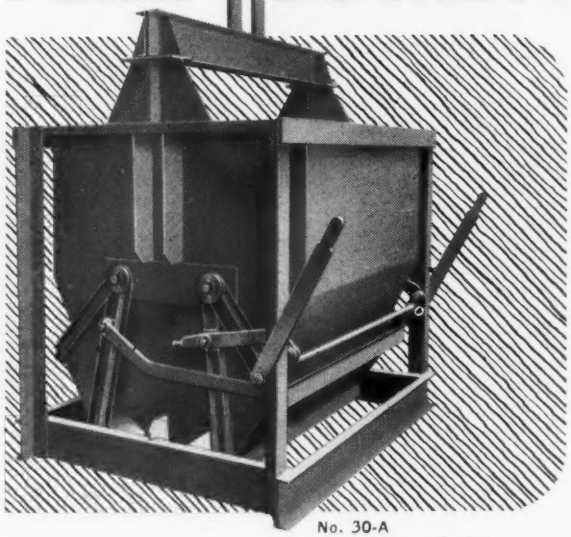

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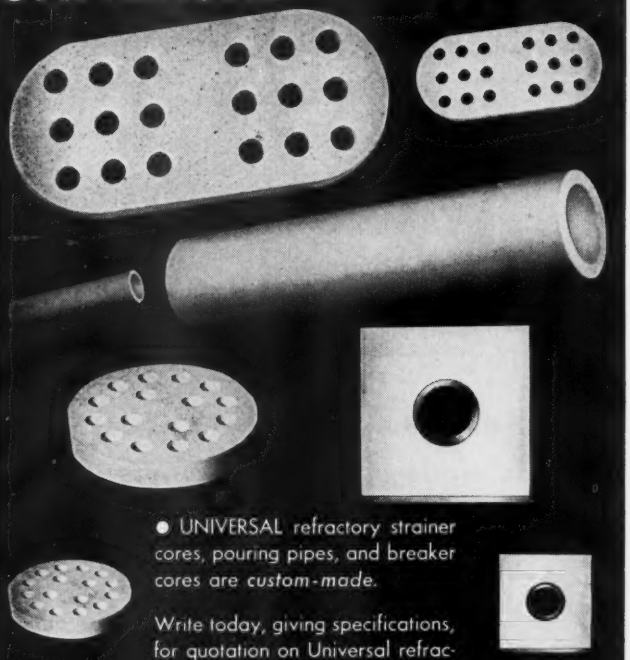

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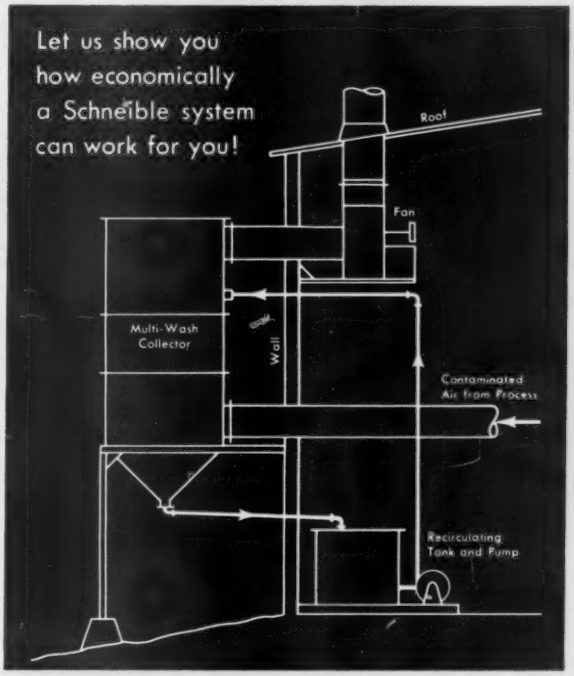

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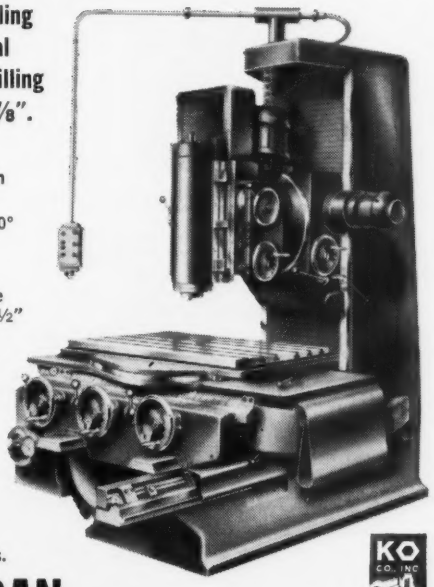
Use it for radial drilling in addition to vertical milling, universal milling and boring up to 11⅞".



- Column swivels 180° in either direction
- Milling head swivels 90° in either direction
- 37½" throat
- Distance between table and spindle head 0-37½"
- Rotary table handles bulky work up to 8'2"
- Weight 7½ tons

Smaller models, too.
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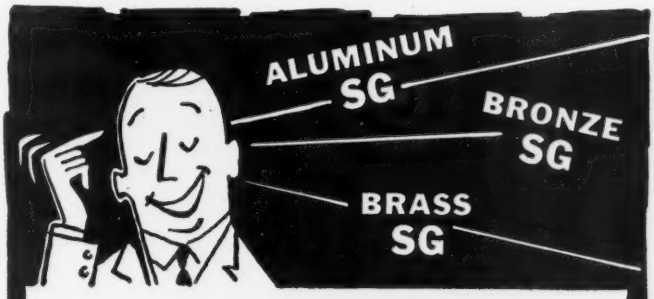

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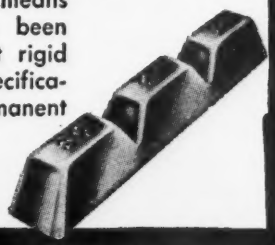
The initials "S-G" on aluminum, brass or bronze ingot means uniform quality that has been produced to meet the most rigid chemical and physical specifications. Whether it's for permanent mold, sand or die cast, you can be confident with "S-G" ingot.



SONKEN GALAMBA CORPORATION
Riverview at 2nd Street • Kansas City 18, Kansas

Dear Reader:

* * * * MANAGING EDITOR BILL GUDE REPORTS THESE FEATURE STORIES SCHEDULED FOR APPEARANCE IN FOUNDRY SOON!

Gas Turbines for Automobiles

* The turbine seems likely to replace the reciprocating engine in the family car, they say! A timely, forward-looking article which discusses the implications of such a change-over on casting requirements.

Shell Molding in a Jobbing Shop

* This will be a description of operations and equipment of Shell-Cast Alloys, Ltd., Guelph, Ontario, Canada. This job shop casts exclusively in shell molds, has several innovations in equipment design, including a sand reclamation system.

Cooling of Foundry Sands

* Will discuss the theoretical and practical aspects involved in bringing sand down to sufficiently low temperature to avoid defects caused by hot sand.

New British Gray Iron Foundry

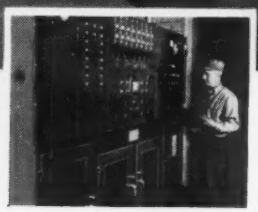
* The new mechanized foundry of W. & T. Avery Ltd., Birmingham, England, described in this story can trace its "ancestry" back to an original foundry built in 1795 by James Watt and Matthew Boulton for the manufacture of their steam engine!

Brass Foundry Operations

* Coming soon - a feature article discussing operations and plant of Neptune Meters Ltd., Toronto, a medium-sized producer of brass castings. Next installment in the popular Harry St. John series is a discussion of how good control can reduce melting losses.

Merry Christmas and Happy New Year!

FOUNDRY



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An 800% INCREASE in production per man,

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That's the success story of one Richardson foundry application.

PROBLEM:

To provide a system of control for the batching of sand and core-binder in the production of steel castings; to coordinate batching machinery with the timed discharge of the automatic scales; to provide infallible electric and mechanical checks to assure immediate stoppage of cycle when any phase of operation is incorrect.

SOLUTION:

A materials handling system consisting of 9 bins, 8 automatic scales, 1 collector conveyor, 1 swivel spout, liquid meters, master control panel, 2 skip hoists, 2 mullors, and reject plows. All weighing and control equipment designed, manufactured and installed by Richardson.

In such a formulating system, using the Richardson equipment specified, G-E engineers in the Everett, Mass., Foundry were able to achieve the outstanding results mentioned above. Sand formulation is now a strictly controlled operation approaching full automation not only in function but in quality control as well. A single operator at a panel board can remotely initiate, sustain, change, or interrupt batch formulation merely by adjusting electric controls. Major advantages of a Richardson system—in addition to increased capacity, labor savings, and quality control—are greater flexiblity, material savings, decreased waste, and easier maintenance.

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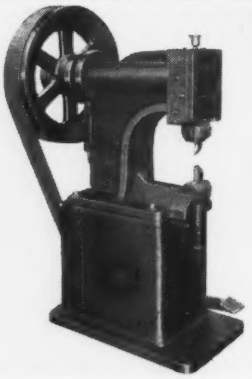

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Heats Ladles
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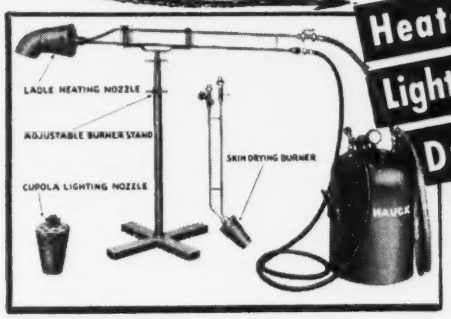

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All-Purpose
BURNER
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The many heating jobs this Hauck Foundry Outfit performs is positively amazing! Interchangeable nozzles make the equipment equal to 3 separate burners. Burns fuel oil, kerosene or any fuel gas, with compressed air. No preheating; no carbon. Flame size instantly adjustable. Eliminates smoke, noxious gases, ashes.

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because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

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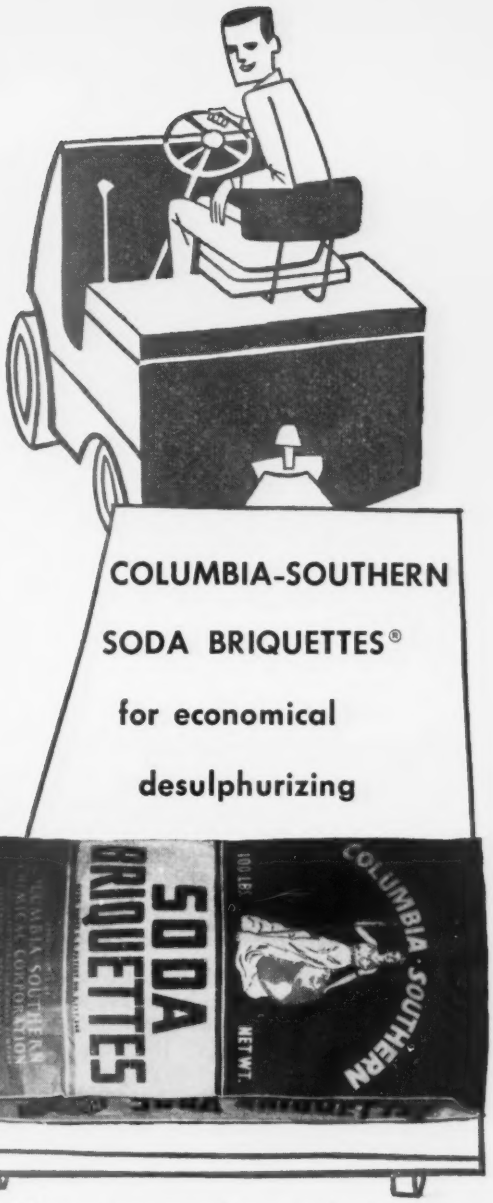

Time and labor are important factors in desulphurizing and cleansing iron as is true in every other Blast Furnace and Foundry operation.

Columbia-Southern Soda Briquettes act fast because their pellet shape, about the size of a walnut, exposes a maximum of surface area for contact with the iron. With fewer man-hours required, production can be accelerated while labor costs are actually reduced.

There are no dusting losses with these briquettes. Working conditions are improved and waste is eliminated. They always hit the mark. You can always depend on fast, efficient results.

Order your supply today by name "Columbia-Southern Soda Briquettes." Packed in 100 lb. paper bags, they are easy to handle, easy to store, and easy to transport.

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IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

No spare parts available, but...

NI-ROD welding saved this lathe!

It looked hopeless when the face plate of this obsolete lathe suddenly shattered. Replacement parts were no longer available. Then a clever maintenance man had an idea: He salvaged the cast iron hub from the broken face plate, cut a new plate out of steel, and welded them together with Ni-Rod* electrodes to form a new face plate. Repaired ten years ago, the lathe is still in regular use today.

Salvage Imperfect Castings, too

No longer must you scrap all defective castings. Blowholes, scabs, cracks, and even broken castings can often be salvaged inexpensively with Ni-Rod and its companion electrode, Ni-Rod "55". Deposits closely match the appearance of cast iron.

When it comes to welding cast iron, Ni-Rod electrodes provide a practical way to do the job. They give sound, machinable welds even in the hands of weldors of limited experience.

Ni-Rod "55" electrodes are chosen for special jobs involving heavy sections, high phosphorus irons, special alloy cast irons and joining cast iron to other metals.

Will They Cut Your Costs?

The best way to find out is to try these two electrodes yourself. Ni-Rod and Ni-Rod "55" electrodes come in 5-lb. packages with instructions enclosed. Try a package today.

In the meantime, to see how others save money by welding cast iron with Ni-Rod and Ni-Rod "55", write for our new booklet, "Repair Cast Iron Quickly and Easily." A copy is yours for the asking.

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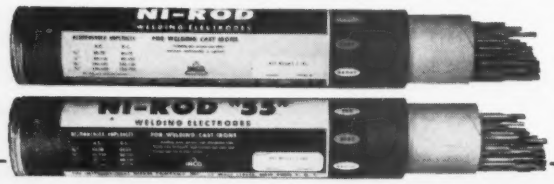
Electrodes • Wires • Fluxes



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Use . . . **SPEKALUMINITE CF**

For: **Sharper and Cleaner Cut Stampings • Less Descaling • Less 'Downtime' for Die Lubrication • Lower Cleaning and Descaling Costs • Increased Die Life • Cleaner Work**

SPEKALUMINITE CF reduces or eliminates oxide scale. Gives aluminum killed steel skin effect. Traps oxygen before it can attack susceptible heated parts. Slow oxide build-up reduces the necessity for frequent lubrication and increases die life.

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AUTOMOBILE CYLINDER LINERS

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WATER-COOLED
Model M-WC
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Utilizes low cost permanent molds of available steel tubing to produce gray machinable cast iron or bronze bushings. Water cooled molds can be maintained at either high or low temperature easily. High or limited production in very small space with unskilled labor. Completely safe for workmen. Simple, sturdy equipment. Quick changeover from one mold to another. Practically 100% metal yield o. high quality, denser castings. Metal porosity eliminated.

Write for new Bulletin # 153 Illustrating Model M-WC

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We have available an Experimental Foundry equipped for ferrous and non-ferrous melting for both vertical and horizontal centrifugal casting production. Our facilities are available to foundries for research or trial centrifugal castings at low cost.

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B&A POTASSIUM TITANIUM FLUORIDE
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Many Advantages

When making aluminum castings, the use of B&A Potassium Titanium Fluoride results in finer grain structure, with improved yield and tensile strength, greater elongation and better machinability . . . all leading to lower production costs, better products!

Low-Cost Way of Adding Titanium

The incorporation of titanium into aluminum alloys may be accomplished more economically with Potassium Titanium Fluoride than with other methods.

Adding Potassium Titanium Fluoride

Where temperatures are in the range of 1400°F, the Potassium Titanium Fluoride may be added straight or, if lower operating temperatures are employed, a mixture of this salt with Potassium Fluoborate, which has a lower melting point than straight Potassium Titanium Fluoride, may be used.

And . . . Investigate B&A Alkali Fluoborates

B&A Alkali Fluoborates are easily-handled purifying salts which the foundryman can use like precision tools for a wide range of purposes when casting magnesium, or when refining, melting or heat-treating aluminum.

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For information on these high purity chemicals, call or write any of the Baker & Adamson offices listed below.

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GENERAL CHEMICAL DIVISION
Allied Chemical & Dye Corporation
40 Rector Street, New York 6, N. Y.

Offices: Albany* • Atlanta • Baltimore* • Birmingham* • Boston* • Bridgeport* Buffalo* • Charlotte* • Chicago* • Cleveland* • Denver* • Detroit* • Houston* Jacksonville • Kalamazoo • Los Angeles* • Milwaukee • Minneapolis • New York* Philadelphia* • Pittsburgh* • Providence* • St. Louis* • San Francisco* • Seattle Kennewick* and Yakima (Wash.)

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*Complete stocks carried here

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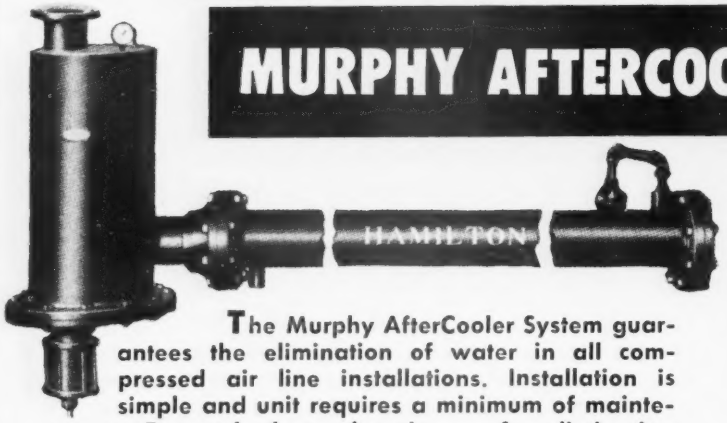

The Murphy AfterCooler System guarantees the elimination of water in all compressed air line installations. Installation is simple and unit requires a minimum of maintenance. For cool, clean, dry air . . . for eliminating "down time" in compressed air operated tools and equipment . . . install a Murphy AfterCooler System in your plant now!

Write today for Bulletin No. 1, outlining complete details on the Murphy AfterCooler System!

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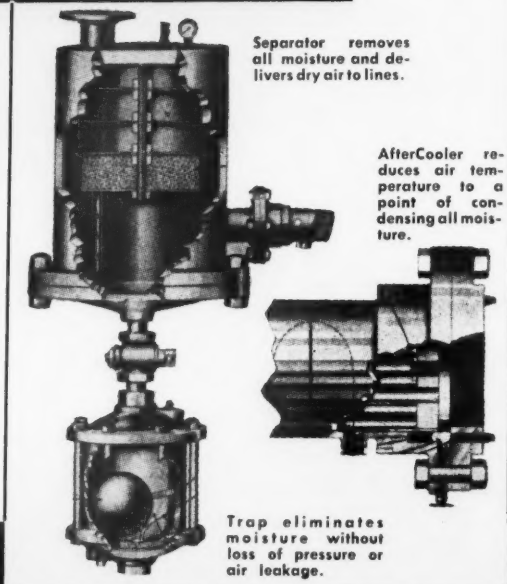
AFTERCOOLERS • SEPARATORS • STRAINERS
TRAPS • SPRAY GUNS • PISTOL SPRAYERS


Separator removes all moisture and delivers dry air to lines.
AfterCooler reduces air temperature to a point of condensing all moisture.
Trap eliminates moisture without loss of pressure or air leakage.

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REQUIRED FOR FULLY MECHANIZED NONFERROUS FOUNDRY

Applicant must have extensive experience in all phases of foundry procedure and supervision, including Electric Furnaces — Metallurgy — Foundry—Millroom—Pattern Shop and Stores.

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Some knowledge of Synthetic Sand Practice and Shell Molding an advantage.

Age and Salary open.

Reply in confidence to:

PERSONNEL MANAGER
BOX 698
LONDON, ONTARIO, CANADA

CHIEF INSPECTOR

Medium-sized midwestern electric steel foundry needs Chief Inspector to take full charge of Inspection Department. Must have knowledge of casting inspection procedures and be able to contact customers. Engineering background desirable. Address: Box 776, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

PLANT ENGINEER with electrical background for malleable iron foundry in New England. Must have had experience in supervising foundry plant maintenance. Full details will be given in personal interview. Write giving all pertinent information to: Box 772, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

FOUNDRY ASSISTANT

Foundry Assistant needed by captive Bronze and Aluminum foundry. Prefer experience in Bronze and Aluminum tablets, memorials and commercial castings, must have experience in plant efficiency, planning, research and operation. Age 30 to 35, with approximately 12 to 15 years' experience.

Salary open and commensurate with qualifications. Good opportunity for the right man.

Give personal history, experience, reference and salary expected.

BOX 798, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY ENGINEER

Excellent opportunity in progressive foundry for right man, supervising sand and quality control. Mechanized gray iron foundry located in central Indiana. Position offers opportunity for advancement. Age 25 to 35 years.

BOX 738, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

Steel Casting Jobbing Foundry located in Western Pennsylvania producing medium and light castings of Carbon and Alloy Steel. We are interested only in fully experienced foundryman having qualifications to take complete charge of operations in absence of Foundry Manager. Send resume of experience and salary desired. All replies held confidential. Address: Box 805, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

ASSISTANT OPEN HEARTH SUPERINTENDENT

Large basic Open Hearth Steel Foundry has opening for experienced man preferably with metallurgical background to assume duties of assistant superintendent in our Open Hearth department. Plant located in western Pennsylvania. Send resume of experience and salary desired. All replies held confidential.

BOX 743, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY ENGINEER

Position with industrial organization developing new and unusual metal forming and treating processes. Necessary to have degree in engineering. Metallurgy preferred. Additional education in foundry sand technology, melting and purifying metals and gating and risering of castings desirable. Minimum of two years' experience in foundry industry working with ferrous and nonferrous cast material production. Ideal Southern California community and environment factors. Address: Box 791, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ENGINEER

Gray iron foundry, Philadelphia area, light and heavy castings; well experienced, willing to do some field work. Must have thorough knowledge of all phases of the foundry. Address: Box 789, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GENERAL FOREMAN CLEANING ROOM

Large eastern steel foundry has an excellent opening for a general foreman cleaning room. In reply give age, experience, references, and salary desired. Address: Box 714, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

FOUNDRY ENGINEER

Young man with Mechanical Engineering background preferred, for well established modern gray iron foundry located in Chicago area. Must be well versed in foundry practices and capable of making pattern layouts and estimating weights from blueprints. Excellent opportunity with growing, progressive organization. Submit full particulars regarding personal data and experience.

BOX 796, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

CORE ROOM FOREMAN

Progressive gray iron foundry located in Northern Indiana is expanding core operations. Has capacity open for energetic core foreman. This is an excellent opportunity for a person who is planning a future. Applicant must be well versed in coremaking and have leadership ability. Apply:

P.O. BOX 311
BLUFFTON, INDIANA

PRODUCTION FOREMAN

Large malleable foundry has opening for production foreman thoroughly familiar with molding of malleable castings. Send resume of experience and salary desired. All replies held confidential.

BOX 709, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

ENGINEER INDUSTRIAL

Experience in heavy gray iron. Large Connecticut foundry. Capable of establishing new basic time standards. Also analyze foundry operations for cost reduction. Indicate experience and salary requirements.

BOX 781, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST OR METALLURGICAL ENGINEER

Recent graduate, needed for manufacturing research laboratory of progressive steel castings company in midwest. Opportunity to do applied research and pilot plant work on metallurgy of cast steels, development of new molding techniques and casting processing methods. Experience useful but not essential. In reply indicate education background, military status and experience. Address: Box 771, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

For well established, financially strong, malleable casting foundry in the East, employing 250 men. To be in charge of air furnace batch type melting, sand control, and other details assisting plant manager. Write personal data, salary desired and resume of experience. Address: Box 737, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER

Long established, progressive, midwest steel foundry expanding production facilities and needs sales engineers working out of Chicago and Detroit. Age 30 to 40, industrial sales experience (not necessarily in foundry) college degree in engineering or equivalent in experience. Send complete resume, salary information, and recent photograph if available. Address: Box 774, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Want capable gray iron foundryman with understanding of iron, sand and molding, machine and floor type work. Should possess good supervisory qualities. Give age, complete job history and salary expected. All replies confidential. Address: Box 786, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ASSISTANT

Foundry assistant needed by captive gray iron foundry of medium size heavy process machinery manufacturer. Young college engineer graduate preferred. Should have had some foundry experience. Is to help increase plant efficiency, planning, research and operation. Company has liberal profit sharing plan. Salary open. Location S.E. Pennsylvania. Address: Box 713, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

Steel foundry in East desires services of graduate metallurgist with some experience in acid and basic melting procedures and sand control. Please give full particulars regarding background and salary desired in first letter. Address: Box 773, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

CORE ROOM FOREMAN

A middle west malleable foundry needs an experienced foreman for core room. Primarily small cores made by female workers. Most modern equipment. Give age, salary requirements, complete history of experience and past employment and references. Confidential.

BOX 783, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

DESIGNERS—DRAFTSMEN—ENGINEERS

Experienced in foundry layouts and equipment. Age 30-45. Send experience record, personal data, recent photo and references.

BOX 730, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SAND MAN

Large malleable foundry has opening for man thoroughly familiar with molding sands to take complete charge of synthetic sand system.

BOX 795, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

Must have magnesium or aluminum experience. Majority of time will be spent on production problems which will consist of improving the procedure on established jobs and the rigging of new work. Remainder of time will be spent on development and research.

Mr. J. S. Wickham
WELLMAN BRONZE & ALUMINUM CO.
2525 EAST 93rd ST.
CLEVELAND 4, OHIO

TECHNICAL DIRECTOR

Medium-sized midwestern electric steel foundry offers excellent opportunity for technically experienced steel foundryman to assume charge of established technical division responsible for metallurgy, inspection, pattern rigging and product development. Please include age, education, and resume of experience with reply. Address: Box 775, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

NONFERROUS FOUNDRY FOREMAN

Medium size aluminum foundry near Cleveland, specializing in medium and large jobbing work. Must know all phases of foundry operations and aluminum alloys. In reply give age, experience, references, and include photograph. Address: Box 790, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

HELP WANTED

We desire to set up our production of small steel castings on a piece-work basis instead of hourly rates. We need the services of someone who is thoroughly familiar with such an operation, capable of installing this system in our foundry. Salary open. All replies confidential. Address: P.O. Box 13294, Houston, Texas.

WANTED

Experienced estimating engineer for work in a nonferrous foundry. Located in Massachusetts. Must be familiar with sand casting process. Address: Box 740, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

OPPORTUNITY

For Metallurgist or Engineer interested in the precision casting field to do engineering-sales work for producer offering every chance to advance with the business. Experienced production know-how and product contact necessary. Address: Box 785, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

For small gray iron foundry. Experienced and qualified to show high efficiency. Located in Southeast Pennsylvania. Write giving full details of personal background, experience and salary desired. Address: Box 765, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER—PRECISION CASTINGS

Prominent manufacturer of high quality precision castings, ferrous and nonferrous has need for capable, aggressive Sales Engineer. Should have metallurgical background, preferably degree, and be familiar with needs of industry in the precision (investment) casting field. Good possibilities for advancement for the right man. Salary commensurate with experience and ability. Midwest location. Please forward resume to: Box 778, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

FOUNDRY SUPERINTENDENT

Want competent cast iron foundryman with understanding of iron, sand and molding, machine and floor type work. State salary, references and experience. Apply:

WARREN FOUNDRY & PIPE CORPORATION
183 SITGREAVES STREET
PHILLIPSBURG, NEW JERSEY

WANTED

Man experienced in all phases of foundry practice. Capable of taking charge of a large ferrous foundry as general superintendent. Man with steel experience preferred. Address: Box 745, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

HELP WANTED

Foundry engineer age 28-35 experience in time study, core shop practice and sand control for large mechanized eastern foundry. Address: Box 762, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

With precision casting foundry experience. To serve as sales engineer and take full charge of important pilot precision casting foundry. Location Port Washington, Long Island. Write details and salary. Address: Box 804, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

FOUNDRY SUPERINTENDENT OR WORKS MANAGER

Thirty-two years' practical experience, ferrous and nonferrous, jobbing and production. Fully qualified to take complete charge all foundry operations. Iron by analysis, high and low carbons, also brass, bronze, aluminum. Have held superintendent positions for past 25 years in Pennsylvania and Alabama. Can also make green sand castings look like the shell castings which are made in shell molds. Now employed. Address: Box 767, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

INVESTMENT CASTING ENGINEER

Supervised all phases lost wax and plastic process in small shop doing production, development and research as a service to a larger organization. All metals. Familiar with formulation of process materials, evaluation of process changes and development of plant equipment. Chemical Engineer. Read and write German, French and Russian. Available for top-level supervision, development, engineering or research. Address: Box 797, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY MANAGER—ASSISTANT TO PRESIDENT

Capable executive, 34 years of age, with B.S. degree in metallurgical engineering, desire position with progressive minded organization. Extensive foundry and metallurgical background. Cost, quality and production minded. Instrumental in developing the latest foundry techniques; Ductile iron, shell molding, water cooled cupolas both acid and basic, all now in successful operation. Address: Box 784, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EXPERIENCED PRACTICAL FOUNDRYMAN

On both steel, iron and manganese steel. Have been general foreman, superintendent and consultant. Can furnish the best reference. Address: Box 799, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT FOREMAN

Desire position in gray iron or nonferrous, jobbing or production. Well versed in all phases of foundry operation. Practical and Technical. Fifteen years in supervisory positions, available immediately. Address: Box 752, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Thirty-eight year old Mechanical Engineer, 16 years' foundry experience in ferrous and nonferrous high production foundries. Shell molding experience—extensive experience in foundry mechanization, design of foundry equipment, foundry layout and methods. Desire midwest. Address: Box 782, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WORKS MANAGER—SUPERINTENDENT

Capable of operating a 350 man organization, 23 years of experience in casting ferrous and nonferrous metals in sand, permanent and investment molds profitably. Address: Box 792, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

FOUNDRYMAN

I am 56 years of age, married, active, in good health, have a technical education and 32 years of practical foundry experience in gray iron and malleable, including the cupola mixing of irons, sand control, estimating, cost time study, and trouble shooting. Have been superintendent and foreman for the past 25 years. Would like to locate in the south or southwest if possible. Address: Box 766, FOUNDRY, Penton Bldg., Cleveland 14, Ohio.

EXECUTIVE

Experience in all phases of foundry operations and management. Thorough knowledge of machine shop, pattern shop, engineering, metallurgy, foundry cost and estimating, sales and industrial relations. Registered mechanical engineer, 25 years' experience foreman, superintendent, general manager and vice president. Foundry running 150 tons daily. Address: Box 802, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

STEEL FOUNDRYMAN

Supervisory capacity with twenty years' experience in all phases steel foundry. Producing steel castings ranging from one pound to three tons. Good knowledge of foundry methods. Familiar with heading and gating and rigging of patterns for machine sandslinger production, sand control. Married. Address: Box 794, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Desire connection with small or medium-size foundry. Twenty-seven years' practical and technical experience, fourteen in supervision, jobbing or production, molder, coremaker. Age 46. Married. Available January. Address: Box 761, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE AND METALLURGICAL ENGINEER

Presently managing gray iron foundry seeking new affiliation with progressive gray iron or malleable foundry or sales organization. Experience in management, technical, sales and operational phases of gray iron and malleable. Age 34. Address: Box 800, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumbers supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 744, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CHICAGOLAND REPRESENTATION

Nonferrous foundry representative in Chicago and vicinity would like to represent medium sized, progressive iron and steel foundries. Address: Box 770, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Am thoroughly qualified to produce quality castings in any ferrous foundry by training the supervisors and setting up standard practices in all departments so that costs and scrap will be kept at uniformly low levels. Am available now. Address: Box 763, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MICHIGAN REPRESENTATIVE

Practical Steel Foundryman with thirty years' experience would like to represent a Steel Foundry capable of making large dies up to fifteen ton and over. Address: Box 803, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Consultant

CONSULTANT

Specializing in quality control by installing the correct techniques for **CENTRIFUGAL CASTING, PERMANENT MOLDING** and sand molding of brass and bronze castings. Address: LEIGHTON M. LONG, TONTOGANY, OHIO, PHONE: TONTOGANY 3065.

Opportunity

PERMANENT MOLD METHOD AVAILABLE THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS.

Confidential Inquiries Invited
From Employers and Qualified Applicants.

For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **HARRISON 7-8600**
JOHN COPE, DIRECTOR **220 SOUTH STATE ST., CHICAGO, ILL.**

Representatives Wanted

REPRESENTATIVE WANTED

Medium size Wisconsin aluminum foundry wants representation in adjoining states. Desire someone now handling or experienced in allied lines. Commission Basis.

BOX 788, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SEVERAL EXCLUSIVE TERRITORIES

For aggressive organizations now calling on foundries, all types. No supply houses wanted unless you offer capable equipment engineering and service. Nationally advertised, well known line includes shell molding equipment, core blowers, core draw machines, combination blower and draw machines, molding machines, miscellaneous foundry equipment, custom-building and testing equipment. Liberal commissions. Address: Box 793, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES REPRESENTATIVES

Through our advertising in FOUNDRY and other trade magazines, we are receiving inquiries for our strainer cores, poring pipes and other ceramic specialties. We require experienced sales representatives to contact these interested prospects and introduce our line of products to all foundries in several good territories. Please give detailed information about yourself and other lines handled in first letter. Address: MR. C. L. EVANS, UNIVERSAL CLAY PRODUCTS CO., SANDUSKY, OHIO.

SALESMEN

To travel Northeast Atlantic States introducing new line of alloys and metallurgical products. Good opportunity to right men. In reply give knowledge and experience. Address: Box 768, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SAND SALESMAN

Excellent opportunity for a hard worker. Midwest territory. Give full details of your past employment and personal history. Address: Box 787, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry For Lease

FOUNDRY FOR LEASE

Established gray iron jobbing shop. Capacity ten tons per day. Pattern and machine shop. Address: Box 769, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundries For Sale

FOUNDRY FOR SALE

IRON FOUNDRY, 45,000 sq. ft. specializing in semi-production castings up to 1000 lbs. Pouring 12 tons per day. Excellent equipment. Low cost operating area. Long record of profitable operations. Price $210,000.

EDWARD H. ZOLL
FOUNDRIES SOLD AND LEASED
790 BROAD ST. NEWARK 2, N. J.

FOUNDRY FOR SALE

Brass foundry and machine shop, manufacturing marine hardware, propellers and fire fighting equipment in Vancouver, Canada. Good opportunity of securing a going business. Address: Box 742, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOR SALE

Small nonferrous foundry in operation; Southern Ohio, or would consider partner. Address: Box 758, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Wanted-To-Buy

WANTED TO BUY

Osborn 276-J-13'' Portable Squeezers —or equal

Osborn—Rotolift.

Give complete details and lowest cash price.

BOX 801, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANTED

45" and 55" lifting magnets, any condition.

call or write:

ERIE ELECTRIC CO., INC.
120 CHURCH STREET
BUFFALO 2, N. Y.
TELE:
CLEVELAND 4758.

WANTED TO BUY

1—Walker-Turner (or equivalent) Radial Drill Press
1—Flexible Shaft Grinding Machine.
1—Radial Drill Press, 6', 17" Col.
1—#3 Universal Milling Machine (or equivalent) motor driven.
All 220 Volts, 3 phase, 60 cycle.
Philadelphia Area.

BOX 779, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MACHINERY WANTED

2—SPO-#506; 1—SPO-#508 rollover; 1—SPO-#3070 or 3072 pin lifter; 1—NC-4 Royer Sand Separator; 1—International 12 x 15½" PKL or larger pin push off machine. Address: PRECISION ALUMINUM FOUNDRY, 5269 W. GRAND AVENUE, CHICAGO 39, ILLINOIS, PHONE—MERRIMAC 7-0200.

WANTED

Car Type Annealing Furnace, 6' x 12'—oil fired. Electric Arc Melting Furnace, one to two ton melting capacity—with controls and transformers. Address: Box 780, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

SAND BLAST EQUIPMENT
WE BUY SELL TRADE

15" Continuous Wheelabrator	$4,500.00
42 x 48 Wheelabrator Tumblast	2,500.00
36 x 42 Wheelabrator Tumblast	3,000.00
27 x 36 Wheelabrator Tumblast	2,500.00
15 x 20 Wheelabrator Tumblast	1,600.00
12' American Plain Table	5,000.00
4' American Wheelabrator Tablast Table	2,500.00
Pangborn 9' L. G. Table (Side Throw Wheel)	4,500.00
Pangborn 6' L. G. Table	2,500.00
Pangborn E. S. 421 Shell Blasting Machine	3,500.00

Horizontal and Vertical tumbling barrels, Hand cabinets, and dust collectors. All types and sizes. Reasonable.

ATTENTION CANADIAN BUYERS

We still have two 42 x 48 wheelabrators in Canada. These can be purchased Duty free. Priced at $2,500.00 and $3,000.00 Excellent Condition. Also 42 x 48 Wheelabrators in Detroit need repair at $950.00 and $1,500.00.

DIAMOND SAND BLAST INC.
4654 West Jefferson Ave.
Detroit 9, Michigan
Phone Vinewood 3-6750.

For Sale

FOUNDRY EQUIPMENT

Grinder, 2 wheel, pedestal type, Gardner #4 complete w/7½ hp motor, serial No. 4-24.
Grinder, pedestal type, dbl. end 12" wheel, model 102 Cincinnati w/2 hp motor less stand, serial No. 75055.
Polishing Machine, 10" ped type, 2 wheel w/5 hp motor, Mitchell, serial No. 739.
Crusher & Pulverizer, Williams w/25 hp motor. Metal Crusher, New Century.
Pulverizer, Model SF w/10 hp motor, Jeffrey Jr. 220/440 V.
Molding Machine, used "Tabor" 36" plain jar.
Magnetic Separator, Dings 24" w/3 hp motor, serial No. 14350.
Magnetic Separator, Stearns w/5 hp motor.
Wire Cutting Machine, Lewis #7 w/½ hp motor.
Furnace, heat treat, electric salt bath, 40 KW, serial No. 27914.
Furnace, heat treat elec. vert. type, temp. 1000°, Young Bros.
12 ft. lift, 120 KW max, load 1000#.
Furnace, heat treat, Bellevue #555, serial No. 17015
Hoist, 1 ton, Chic Pneumatic, serial No. 604.
Air Hoist, type P, size 2, 3000# cap. Detroit.
Scale, floor type, 12,500# cap. Howe, 8' x 6' platform, serial No. 1180390.
(2) Blowers, 10" American.
Blower, #3P American, Sirocco, serial No. 51331.
Blower, American, Sirocco #3V, serial No. 6326.
Blower, American, Sirocco #5.
Blower, American, Sirocco #5V, paddle type w/5 hp motor.
Blower, #5V w/5 hp motor. American, Sirocco, serial No. 12576-1.
Blower, American, Sirocco, #5-V w/5 hp motor.
Blower, American, size 5½ Sirocco, serial No. 7498A.
Blower, Buffalo Forge #23.
Blower, #7 type C1 Clarage.
Blower, Clarage, type SPEC size 13 w/3 hp motor, serial No. 104019.
Blower, paddle type, approx. 3' dia. x 10" w, w/3 hp motor.
Dust Collector, cloth bag type, Parsons 33'4" x 8'8" w x 21'6" high.
Dwg. A-5619-1A-4680 Sq. Ft. filtering area w/ motors.
Dust Collector, wet type 500 CFM "Uni-Wash"
Spencer-Turbo Compressor blower 550 CFM 20 oz., 220 volt motor, 3 hp.
Spencer-Turbo Compressor blower 150 CFM 24 oz., 220 volt, 2 hp motor.
Spencer-Turbo Compressor blower 85 CFM 20 oz. lot 15802, 220 volt, serial No. 18017.

BOHN ALUMINUM & BRASS CORP.
1400 LAFAYETTE BLDG.
DETROIT, MICH.

FOR SALE

One 3-ton Heroult Electric Arc Furnace with General Electric 1500 KVA Transformer, 11,800 volt primary—150-90. New control panel, new cable and all electric parts.

25 sets heavy steel flasks, 41" x 47", 18" cope, 8" drag.

30 sets 30" x 30" flasks, 14" cope, 8" drag.

7 sets 46" x 50" steel flasks, 15" cope, 15" drag. These flasks are made by Shanafelt and have never been used. Can be bought cheap.

BOX 764, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

GRAPHITE RODS . . .

Savings up to 25%

A surplus of over 84,000 AGR Standard Graphite Rods must be moved immediately. Here's an opportunity to supplement your present stocks at savings up to 25%. All rods are 12" long.

SIZE	QUANTITY	SIZE	QUANTITY
9/32"	14,500	17/32"	8,477
19/64"	4,350	9/16"	5,600
11/32"	800	5/8"	597
3/8"	14,120	3/4"	5,137
13/32"	14,640	28/32"	296
15/32"	17,192		

Write or call W. Eckert at:

THE INDIANA STEEL PRODUCTS COMPANY
VALPARAISO, INDIANA VALPARAISO 2-5601

FOR SALE

Despatch gas fired core baking oven complete with electronic control. Double chamber, inside measurements each side 5'-3 wide x 13'-4 deep x 7'-7 high.

Sutorbilt positive pressure blower with anti-friction bearings. Size 16 x 43, 15 C.F. per rev., 3 lb max. pressure, normal max. RPM 325.

Other gray iron foundry items

VIERLING STEEL WORKS
53 W. JACKSON
CHICAGO 4, ILLINOIS
HARRISON 7-7550

For Sale

FOR SALE

MOLDING MACHINES

1—Herman, Jolt, Rollover Draw, 6000#, 40" x 60" table.
2—International, Jolt, Rollover Draw, 24" x 10G, Stationary.
2—International, Jolt, Rollover Draw, 20" x 8-G. Portable.
2—No. 275 Osborn jolt squeezers. Stationary.

CORE OVENS

1—Coleman Recirculating 3 section with 5 drawers per section. Gas fired.
1—Coleman Recirculating 4 section with 5 drawers per section. Gas fired.

BLOWERS FOR CUPOLAS AND FURNACES

1—Connersville Rotary Blower, 3500 CFM.
2—Spencer Turbine, 30 HP, 3000 CFM, 24 oz.
2—#7½ Roots rotary blowers—27 x 81—14000 CFM.
2—Connersville Rotary 14" x 27" HD, 2750 CFM at 5# press.
1—Connersville rotary blower 22 x 66 45 cu ft per revolution 9000 CFM.
Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—2 HP 20-oz. Spencer Turbine Blowers.
2—Spencer Turbine Blowers, 3000 CFM, 24 oz., 30 HP, 3/60/220-440 V.

METAL MELTING EQUIPMENT

1—1000# open flame brass melting furnace, gas fired.
1—Hausfeld Stationary Brass, oil or gas burner, 2000# cap.
1—Hausfeld Tilting crucible, gas, 250# Al, Cap.
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.

MISCELLANEOUS

1—Beardsley & Piper Model S Screenerator.
1—Pangborn 1 to 4 nozzle air blast generator, complete.
1—Sullivan, 2 stage compressor, 14-8¾ x 10. 75 HP.
1—Sly Tumbler 24" x 40".
1—International SB-11 core blower.
2—Pangborn cloth screen collectors. 2 HP.
1—Stoney crane type shakeout.
1—NC-4 Royer sand separator.
1—#16 Roto-clone unit complete.

Complete stock of rebuilt mill and dust exhaust blowers.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

Lectromelt 250 lb. Type "U" Side Charge Electric Furnace—Complete —Good Condition.

BEAVER VALLEY ALLOY FOUNDRY CO.

MONACA, PENNSYLVANIA

FOR SALE

1—Simpson Mixer #2, 20 HP motor.
Miscellaneous: Screens, Pulverizers, Grinders, Tyler Rotap Screens, etc.
Wanted: Your Idle Machinery.

OUR 38TH YEAR

CONSOLIDATED PRODUCTS CO., INC.
66 BLOOMFIELD STREET
HOBOKEN, NEW JERSEY
HO 3-4425 N. Y. TEL. BA 7-0699

MOTORS—GENERATORS
TRANSFORMERS

Unused — Rebuilt

WORLD'S LARGEST INVENTORY

ELECTRIC EQUIPMENT COMPANY
Phone Station Collect GLenwood 6783
P. O. Box 51 — Rochester 1, New York

FOR SALE

Reda Series 1000 Furnace, gas or oil fired, hydraulic tilting, complete, for nonferrous or ferrous melting.

ULSTER FOUNDRY & MACHINE CORP.
KINGSTON, NEW YORK

For Sale

WE ANNOUNCE THE OPENING OF OUR MACHINE REPAIR SHOP SPECIALIZING IN REPAIRING AND REBUILDING FOUNDRY EQUIPMENT
FOUNDRY EQUIPMENT AVAILABLE—IN STOCK

Jolt Squeeze Strip Pin Lift Molding Machines

2 #724 PJ Osborn; 38" x 56" table; 28" squeeze cylinder; 11" jolt cylinder; 10" draw with hopper; 9" squeeze stroke; 4000 lb. cap. new in 1948; excellent condition; extra large size.
1 #163 Milwaukee—Table size 16" x 28"; actual capacity 16" x 44"; frame lift type; 1500 lb. capacity; also #143 and #183 Milwaukees.
1 Nicholls—Type B; 1945 machine; 14" cylinder; 14" x 36" table.

Jolt Rollover Molding Machines

1 #918 Jonnston & Jennings—44" x 54"; 18" draw; no pit required.
1 International—Type F; Table size 31" x 12".
3 Osborn Power Rollovers—Model 2047-4; Cap. 18" x 24"; stationary; 1942 machines.
2 Osborn #601; 750 lb. jolt capacity; 30" overall flask length.
1 Osborn #602; 750 lb. jolt capacity; 36" overall flask length.
1 Osborn #605; 750 lb. jolt capacity; 54" overall flask length.
1 SPO—Model #914; 14" cylinder; 30" capacity
1 Tabor 30" x 40", extends to 69", 12" draw, shockless type, 1500 lb. cap.

Jolt Squeezers

1 Nicholls Type D Jolt Squeezer.
2 Osborn #275 J Jolt Squeezers; table size 16" x 20"; 10" squeeze cylinder diameter.

Push Off Machines

1 Champion Push off machine; Model LLA-45; table size 45" x 26"; used with sand slinger.
1 International Push off machine; Model LP—Portable pin lift; used with sandslinger.

Core Blowers — Core Rollovers — Core Draw Machines

2 #193 Osborn — for medium sized cores; equipped with air operated draw pistons.
1 #94 Osborn—for large cores.
2 Osborn Hand Rollovers—Model 42; table size 14" x 20½"; maximum width of Core Box —22".

Material Handling Equipment

2 Model HA Hough Payloaders—Rebuilt.
2 Clark Fork Lift Trucks—6000 lb. Capacity
2 Lewis-Shepard Platform Lifts—6000 lb. capacity.
1 Baker Raulang Fork Lift Truck—6000 lb with ready power unit.
1 Elwell Parker Fork Lift Truck—6000 lb. with ready power unit.
1 Yale Fork Lift Truck—6000 lb. with ready power unit.
1 Mercury Fork Lift Truck—2000 lb.—Electric.

Furnaces

1 Stroman 2000 lb. Tilting Hydraulic; New in 1944.

Core Ovens

2 Dielectric—Model 900A and 1800A.

Miscellaneous Foundry Equipment

2 U. S. 7½ HP 3 speed grinders; 28" wheel
1 #50 Beardsley & Piper Speedmuller.
2 Model S Beardsley & Piper Screenerators.
1 Climax Wire Straightener—#2; capacity 1/16" to ¼"; Ser. CWS 600-44.
1 Royer Screenerator.

FOR THE BEST DEAL CALL
BALCHER MACHINERY COMPANY
6020 EUCLID AVENUE
CLEVELAND 3, OHIO
TELEPHONE: EXPRESS 1-8930

FOR SALE

TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
8375	20oz.	Spencer	340	20oz.	A-B
6000	32oz.	Ing.-Rand	320	12oz.	Spencer
4700	32oz.	Ing.-Rand	250	12oz.	No. Am.
2700	16oz.	Spencer	9000	6"SP	Northern
2500	7oz.	Sturt.	4200	8½"SP	Buffalo
1150	20oz.	No. Am.	3420	8"SP	N.Y.
800	13oz.	Buffalo	2700	5⅝"SP	Ilg
500	12oz.	Buffalo	2500	½"SP	American
400	16oz.	No. Am.	1100	4½"SP	Bayley
380	16oz.	No. Am.	2344	2"SP	Clarage

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE.
CLEVELAND 14, OHIO

FOR SALE

Stearns Magnetic Pulley, 25" long, 18" diameter, 230 volt. New shopworn.

PLEASANT ELECTRIC CO.
1725-27 CENTRAL AVENUE
CINCINNATI 14, OHIO

For Sale

OVENS
FOR SALE, RENT OR LEASE

Infra Red Roller Conveyor 18"w x 20"h x 10'1
Infra Red Monorail 32"w x 22"h x 16'1, Bulbs and Controls
Young Bros. Recirc. Rotary 3 Tier 69" dia x 16"h Complete
Gehnrich Slat Conveyor Recirc. 58"w x 18"h x 10'1 Complete
Lithium Recirc. Box type 24" x 24" x 24" 1200°F Complete
MANY OTHER SIZES AND TYPES TO CHOOSE FROM.

Please call "COLLECT" TOwnsend 8-8450

METAL TREATING EQUIPMENT EXCHANGE
9825 GREELEY
DETROIT 11, MICHIGAN

FOR SALE

2—Model M Sandcutters—American Foundry Equipment Company, size 89/70

1—Model 7 Mulbaro with 5 hp-1750-3 ph-60 cyl-220 motor with controls

1—Herman Jolt-40" x 50", 13" solid cylinder 4" diameter

3—No. 30A Penn Bottom Dump Buckets

For further specifications write:

THE H. P. DEUSCHER COMPANY
SEVENTH & HANOVER STREETS
HAMILTON, OHIO

FOR SALE

Completely overhauled Roots-Connersville Blower, 3200 CFM; max capacity. Will sell for $1000.00—F.O.B. Alpena, Michigan. Price does not include motor. Address: THUNDER BAY MFG. CORPORATION, P. O. BOX 317, ALPENA, MICHIGAN.

For Sale

FOR SALE

American Wheelabrator Tumblast, 36" x 42" complete with controls, dust collector	$3250.00
Wheelabrator Cabinet, 30' x 8', pipe machine	$2500.00
Wheelabrator Cabinet, with 7-14" tables	$ 900.00
Pangborn 4 LE Rotary Turn Table	$ 700.00
American Dustube #185, 16950 CFM with motors, blower	$2000.00
American Dustube #35 with motor and blower	$ 250.00
23—Tabor 10" Molding Machines, power squeeze	$ 75.00
25—Osborn 2047 Rollover Pattern Draw Molding Machines, size of draw 8½"	$ 175.00
Redford bench type Core Machine	$ 150.00
MacLeod, Sly Cabinets, sandblasting, 5' x 3'	$ 250.00

M. ELSTEIN
426 GRAND STREET
JERSEY CITY 2, N. J.

FOR SALE

Never Used Steel Grit
Original Mill Bags

25 Tons—TP 80
20 Tons—TP 110
$75 NT

Manufactured by Cleveland Metal Abrasive Co.

GLAZER BROTHERS
ANDERSON, INDIANA

FOR SALE OR TRADE ON FOUNDRY EQUIPMENT

Beardsley & Piper Semi-Automatic Shell Molding Machine. Pattern size 20" x 24". Never been used. Save $2000.00 on this machine. Address: MURPHY SHELL MOLD & CASTING CO., BOX 14, MORRAL, OHIO.

For Sale

HERMAN MOLDING MACHINE

Heavy-duty, 10,000 lb. capacity
Jolt, Roll, Draw
60" x 156" table
Serial No. 885

Excellent Condition
Inspection Invited

OTIS-OAKLEY IRON & SUPPLY CO.
2940 CARROLL AVENUE
CHICAGO, ILLINOIS
SACRAMENTO 2-5655

FOR SALE

One Zyglo Machine Type—ZA-2D-Ser. No. M2-4340—220 Vo. 3 Ph. 60 Cyc. Equipped with penetrant tank, rinsing station hot water dip tank. Black light inspection at washing; drying chamber; developing station and black light inspection station.

Baskets, penetrant and developing powder included.

LUNKENHEIMER COMPANY
PURCHASING DEPARTMENT
P.O. BOX 360, ANNEX STATION
CINCINNATI 14, OHIO.

AIR COMPRESSORS

4—BURY—2 Stage 17" x 10" x 14" 150 HP-220 Volt—3 Ph-60 Cy. 900 RPM with Controls
1—PENNSYLVANIA 2 Stage 20" x 12" x 14" 225 HP—440 Volt—3 Ph-60 Cy. Synchronous 257 RPM
1—SULLIVAN 16" x 19" Y—125 HP-440 Volt—3 Ph-60 Cy.
1—SULLIVAN 2 Stage 20" x 12" x 14" 225 HP-440 Volt — 3 Ph-60 Cy. Synchronous—257 RPM.

WHITEHEAD EQUIPMENT CORP.
P. O. BOX 939 (Phone: 54379) READING, PA.

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

Electric MELTING FURNACES

MOST COMPLETE STOCK IN THE WORLD

1—Swindell 8 ton 9' diameter Shell Electric Furnace, 2500 KVA transformer, 13,800 or 11,000 V. In our Chicago warehouse.

Swindell Electric Furnace, 5' dia. shell, 350 KVA, 6600 volts.

Swindell Electric Furnace, 4' dia. shell, 250 KVA, 6600 volts.

Swindell Electric Furnace, 5' dia. shell, 500 KVA, 6600 volts.

Allis Chalmers Induction Melting Furnace, 2-600# pots.

Ajax Northrup High Frequency Induction Furnace, spark gap type, 35 KVA with 60# and 17# melting pots.

1—Detroit Electric, 1500# capacity, 13,200 primary voltage. Kuhlman transformers. Complete with controls.

Detroit Electric 350#, Type LFA with Kuhlman transformers and oil circuit breaker, 13,200 primary voltage.

Pennsylvania 1500 KVA transformer, 12000 V. Never used since rebuilt. With complete controls, mostly new, needed for operation of a furnace. New control panel, Field Rheostat, 25 HP, 440 V MG set.

1—1500 KVA G. E. Transformer with taps for 11,000 or 13,800 volts.

Transformers—2—2500 KVA furnace transformers, 11,000 or 13,800 primary voltage.

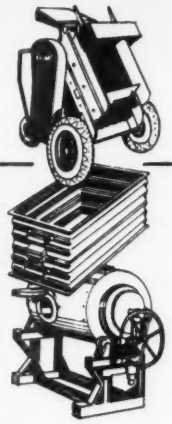
ACME

ACME EQUIPMENT CO., INC.

We will buy for cash a single piece of equipment or your entire foundry

126 South Clinton Street • Phone: ANdover 3-3430 • Chicago 6, Illinois

MONA



EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — CLEVELAND 10, OHIO

5 STEEL APRON CONVEYORS
1—120′ centers x 36″ wide Midwest
1—44′ centers x 30″ wide Link-Belt
1—19′ centers x 30″ wide Palmer-Bee
1—5′6″ centers x 30″ wide Palmer-Bee

3 FLAT BELT CONVEYORS 2—30″ x 45′ x 110′, 1—36″ x 35′.

SAND MULLERS, B-P #70
#1 Simpson,

MAGNESIUM —Whirl Pool Duplex Cleaning Cabinet, 800 CFM—with Buffalo Exhausters. Dimensions — 100″ wide x 65″ deep x 90″ high, 7½ H.P. motors 220/440/3/60.

CUPOLA 1—#3½ Modern

1 BELLEVUE ANNEALING FURNACE — Oil fired all controls, box type 36″ wide x 72″ deep x 24″ high, overall 69″ wide, 88½″ deep, 71″ high. Height clearance required 10′.

. . SPECIAL SALE . .

1 complete gray iron foundry, 18000 sq. ft., #7 Whiting cupola. R. R. Siding, in Belleville, Ohio, 10 miles south of Mansfield.

MISCELLANEOUS MOLDING MACHINES

2—Tabor 22″ x 32″ table, 10″ draw, 600 lbs. cap., air clamps.
3—International Type G, Air Rollover, Foot draw 1000#, size 24″ x 10″.
6—International Type RJ, size 20″ x 8″, Air jolt.
4—International Type R, size 20″ x 8″.
3—Champion Type W22″, 12″ draw, hand rollover.

Rollovers

Davenport
1—A40, 40″ x 64″ table, 3500 lbs. jolt, 24″ draw
2—SA40, 42″ x 50″ table, 3000 lbs. jolt, 18″ draw
1—SA28, 30″ x 40″ table, 1500 lbs. jolt, 12″ draw

Herman
1—40″ x 60″ table, 6000 lbs. jolt, 20″ draw

Osborn
1—405-95, 40″ x 64″ table, 3500 lbs. jolt, 26″ draw
2—342, 23″ x 38″ table, 1,000 lb. jolt, 12″ to 19″ draw

Pushoff: 1—Osborn 3′ x 16′ table.

Jolt Squeezers: J & J, Milwaukee, Osborn, SPO

Jolt Strippers:
2—Milwaukee, 900 lbs. jolt, 17″ x 21″ table, 6″ draw.
1—Davenport AJS34, 36″ x 46″ table, 2500 lbs. jolt, 12″ draw
4—Nichols Frame strip 42″ x 62″, 10000 lbs. jolt, 12″ draw
2—Herman 40″ x 60″ table, 6000 lbs. jolt, 20″ draw

Jolt Squeeze Pin Lift: 4—Milwaukee #125, 1700 lbs. jolt, 12″ squeeze cyl., 8″ draw, 25″ x 30″ table.
6—Milwaukee, #145-1, 600 lbs. cap., 4″ draw, 17″ x 21″ table.
1—International PK-10, 10″ squeeze cyl., 8″ draw, 16″ x 24″ table.
2—Osborn 814-P, 700 lbs. jolt, 8″ draw, 14″ squeeze cyl.
5—Osborn 720U, 600 lbs. jolt, 4″ draw, 11″ squeeze cyl.
2—Nichols 24-54D, 24″ squeeze piston, 1600 lbs. jolt, 8″ draw

Jolt Plain: 1—International Type J, 3000 lbs. jolt, 36″ x 48″ table.
1—International Type J, 10,000 lbs. jolt 76″ x 76″ table.

We carry all makes and types of foundry equipment in stock. Send for our complete listing.

OUR GUARANTEE
IF YOU ARE NOT SATISFIED WITH OUR EQUIPMENT, YOU MAY RETURN IT FOR A FULL REFUND.

We Buy and Sell One Piece of Equipment or Complete Foundries

Telephone . . . GLenville 1-1222

GUARANTEED FOUNDRY EQUIPMENT

THE ACME BARGAIN PAGE

AIR COMPRESSORS
Ingersoll Rand Type 10—14 x 9 x 12, 2 stage, 75 HP, 3/60/220/1200 rpm synchronous motor, 350 CFM at 100#.
5 x 5 Ingersoll Rand 10 HP motor.
Ingersoll Rand Type 10, 800 CFM, 2 stage air compressor, 200 HP, 220 V motor. Rebuilt 1952.

AIR HOISTS
8—4000# Ingersoll-Rand, with trolleys.

BLOWERS
Ingersoll-Rand Motor Blower Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220V G. E. Induction motor.
General Electric 7500 CFM, 20 oz., 89.6 Max. HP, 220V motor, Airway controls.
Ingersoll-Rand turbo compressor 10500 CFM @ 20 oz. 85 HP G. E. 220V 3500 CFM motor.

CLEANING EQUIPMENT
Sly 8′ dia. Table Shot Blast Unit.
36 x 42 Halloway 7½ HP shot motor elevator and dust collector.

CORE BLOWERS
3—International SB 12.
4—International SB 13.
10—Osborn 193.
1—Osborn 2035-2.
1—Peterson (Similar to Demmler #50).
1—Champion CB 400.

CORE OVENS VERTICAL HORIZONTAL
1—Coleman, combination oil or gas fired 43 carriers 24″ x 90″—1 hour 12 min. to 4 hours 48 min. cycle.
1—Coleman, combination oil or gas fired 43—2 shelf carriers 30″ x 144″ long. 2 hour 12 min. to 7 hour 24 min cycle. Present replacement cost over $90,000.

CRANES
1—Milwaukee 10 ton 40′ span, 22′ lift, 220 V. A.C.
2—Northern 5 ton 40′ span, 22′ lift, 220 V. A.C.
1—Whiting 5 ton 40′ span, 22′ lift, 220 V. A.C.

CUPOLA GUN
Bondactor, Model 1250

WE HAVE A LARGE STOCK OF NEW FLASK PINS AND BUSHINGS. TELL US WHAT YOU NEED. WE CAN SAVE YOU MONEY.

GRINDERS
Horizontal Disc (Flat) Grinders:
Gardner #186, 30″ dia. disc. 10 HP, 220/440V, with dresser, wet or dry grinder.
Gardner HV5A, 18″ dia., 7½ HP, 440V, with dresser.
Double End Disc:
2—U.S. 18″ wheels, 2 swing tables, 1 with lever feed.

GRINDERS, SNAGGING
4—Hammond 10 W R I Double End Snag. Grinders 20″ dia. wheels, 10 HP 220/440 V motors, variable speed drives.
2—3″ x 24″ U. S. #65, 20 HP 220/440V.

GRINDERS, SWING FRAME
2—3″ x 24″ x 12″ Fox #4, 15 HP.
1—3″ x 24″ x 12″ Marschke, 20 HP.
1—3″ x 24″ x 12″ U.S. 15 HP.

HOT METAL CARRIERS
3—1 ton D.C. Cab operated Cleveland, Monotractor Hot Metal Carriers.

MOLDING MACHINES
Jolt Squeezers:
5—Milwaukee 103-11 Staty. Jolt Squeezers, 13½″ x 20″ table.
7—Champion JS10P Portable Jolt Squeeze molding machine. 18″ x 21″ table.
5—Osborn 275J.
1—Spo 110J.
Jolt Squeeze Pin Lifts BIG
2—International PK 20's. 20″ squeeze cylinder 8″ draw. Ser. #67237. New 1949.
2—Milwaukee Jolt Squeeze Strippers, Model 163-50, 15″ x 24″ table 16″ X open end pattern size.
1—SPO 214 Jolt Squeeze Pin Lift.
2—Milwaukee 126-3 Jolt Squeeze Pin Stripper, 27″ x 21″ table, 8″ draw. Portable.

ROLLOVERS
Jolt Rollover Pattern Draw
1—Herman 4000# Series 30″ x 60″ table, 32″ x 48″ bumper.
1—Herman 3000# Series 40″ x 84″ table, special slotted table.
1—Herman 1500# Series 20″ x 36″ table.
2—Herman 750# Series 20″ x 30″ table.
2—Herman 750# Series 20″ x 24″ table.
All the above have air clamps rollout tables.
2—Champion JM-18-8 Jolt Rollovers, portable 13½″ x 20″ tables.
1—Davenport 24 SA Jolt Rollover Pattern Draw. 26″ x 42″ flask size, 12″ draw.
3—Spo Model 9032.
1—Milwaukee 217.

PIN LIFT PUSHOFFS
Pin Lift Pushoffs:
2—Champion Pin Pushoffs 28″ x 42″ table 10″ draw.

MULLERS AND MIXERS
Simpson #3 Type H open gear type.
Beardsley & Piper #70 Speedmuller, New style cross head.

OVENS, MOLD OR CORE
Porbeck Double Car Single door 16′ long 14′ wide 9′ high gas fired 600° recirculating complete with 7½ HP car puller, in place St. Louis, Mo.
Core Oven Electric 68″ x 42″ high, 65″ deep 100°-650°

OVERHEAD TROLLEY CONVEYORS
5000′ Jervis B. Webb & Link Belt 658 chain, 4 D.C. motor drive and MG set.

POURING DEVICES
3—Pouring devices, Whiting 500#.

PREPARATOR
B&P #70 Preparator. Only used 3 months.

SAND CUTTERS
1—Model M Screenarator.

STRAIGHTENING PRESS
Hannifin 50 ton hydraulic

ACME
ACME EQUIPMENT CO., INC.
We will buy for cash a single piece of equipment or your entire foundry
126 South Clinton Street • *Phone:* ANdover 3-3430 • Chicago 6, Illinois
MONA

The BIG NAME in Foundry Equipment presents:

SELECT LISTINGS FROM OUR GUARANTEED STOCK

BLOWERS

1—85 HP G.E. Cupola Blower, 24 oz.
3—7½ HP FISHER, 16 oz.
15—CENTRIFUGAL BLOWERS, 350 CFM to 10,500 CFM.

CLEANING EQUIPMENT

1—AMERICAN #1MULTITABLE, 6 aux. tables 15", main table 45".
1—ROBBINS SHAKEOUT 4' x 2'.
1—AMERICAN #2 MULTITABLE, 5 tables, 37" dia.
5—US GRINDERS, double end, 10, 15, 20 HP.
4—GRINDERS, Swing frame, 15 HP.
2—TUMBLING BARRELS, Cast Iron, 36" x 24" w/2 HP Motor.
2—TUMBLING BARRELS, Square, 34" x 48".
2—TUMBLING BARRELS, Side Tilt, 18" wide x 20" deep.

CONVEYORS

4—SAND ELEVATORS, various sizes.
1—STEEL PLATE MOLD, 90' centers, 30" belt, w/drive.
2—STEEL PLATE MOLD, 90' centers, 24" belt, w/drive.
6—SAND BELT CONVEYORS, 10' centers to 140' centers, 18" to 36" belt, complete w/drives and hoppers.
2—CASTING CONVEYORS, wire mesh, 18" x 32" w/drive.

CUPOLAS

1—WHITING, #3½, w/Skip Charger.
2—WHITING #6, Complete with Skip Charger.
1—MORRIS #9, w/skip, mixing ladle, never used.
1—WHITING #5, w/Blower & Air weight Control.
1—MODERN, #3, 46' shell, w/blower.
1—SKIP CHARGER, 3 bottom drop buckets, scale for #9 cupola.

CORE BLOWERS

1—CB-400 CHAMPION. 1—3K DEMMLER.
6—#2 DEMMLER. 2—#2 REDFORD.
1—SB 13 INTL.

FLASKS

150—HINES & FREEMAN ALUM. Pop-offs and jackets, send for list.

FURNACES—DIRECT ARC MELTING

1—250#/hr. Hydraulic Top Charge.
1—500#/hr. MOORE.
1—2 Ton SWINDELL, Top charge.
1—1000# SWINDELL.
2—3000# HEROULTS.
1—2 Ton HEROULT.
1—6 Ton HEROULT.

FURNACES—INDIRECT ARC

2—200# cap. DETROIT, complete.
3—350# cap. DETROIT, complete.
1—1000# cap. DETROIT, complete.
1—750# LFY DETROIT.
2—800# BAILEYS.
1—60# DETROIT, complete.

FURNACES—INDUCTION MELTING

1—20KW AJAX Spark Gap High Frequency, 17 lb. capacity in steel.
3—333 KW, AJAX-TAMA-WYATT, 1500# Alum.
1—30 KW LEPEL, 5# crucible.
1—3 KW AJAX, Lab. type.

FURNACES—OIL AND GAS

1—FISHER 4 Burner MNP, 1700#, gas.
3—WALKER YORK #400 cruc. tilting, coke fired.
1—SKLENAR 600#, Oil fired.
7—HAUSFELD 1000#, tilting, oil fired.
1—HAUSFELD Tilting, 1200# Mag.
1—R & S Convection Draw, Car bottom, 18' l x 8' w x 5' h, oil fired, dismantled, controls.

MOLDING MACHINES

Jolt Rollovers

1—J & J #612, 24" x 30", 12" draw.
1—J & J #815, 30" x 40", 15" draw, 1200# jolt.
2—HERMAN 1500#, above ground.
2—HERMAN, 20" x 24", 750#.
1—HERMAN, 40" x 65", 3000#, short arm.
1—HERMAN, 40" x 59", 3000#, long arm.
1—HERMAN, 50" x 72", 6000# jolt.
1—HERMAN, 42" x 78", 6000# jolt.
1—OSBORN, #243, 27" x 40", 20" draw.
4—TABOR, 22" x 42", pattern draw, port.
1—SPO #506, 24" x 25", 10" draw.

Bumpers

1—OSBORN #102.
1—HERMAN, 60" x 72".

Jolt Strippers

9—DAVENPORT #30T, 30" x 30".
6—OSBORN #276-J
3—OSBORN #275-J
2—OSBORN #559, 25" x 30", 1200#.
4—MILWAUKEE #1536, 32" x 38".
4—SPO, 24" x 24".
2—SPO #213-GP

Jolt Squeeze Strippers

1—OSBORN #175, 21" x 18", portable.
1—OSBORN #710J.
2—MILWAUKEE #163.

Jolt Squeezers

2—INTERNATIONAL, 17" x 20", port.
1—OSBORN #212 PJ, 17" x 23", stationary.
3—TABOR, 18" x 20", 3" jolt, column.
1—TABOR, 18" x 20", 3" jolt, cantilever.
1—ADAMS, 19" x 20", portable.

LADLES & POURING DEVICES

1—WHITING, 10 Ton, Geared, Lip Pour
2—WHITING, 6 Ton, Geared, Lip Pour
1—WHITING, 4 Ton, Geared, Lip Pour
9—WHITING, Geared, 1200, 1000, & 600 lb.
2—WHITING 3 Ton, Bottom pour.
4—10 TON BOTTOM POUR, 55" x 55".
2—45 TON TREADWELL, Excellent.
1—20 Ton lip Pour, 72" x 72".
1—SWINDELL, Elec. Holding.

MULLERS AND MIXERS

1—SIMPSON #1, late type.
2—SIMPSON #3, UNIT DRIVE.
1—SIMPSON #3, enclosed gears.
2—SIMPSON #2, Unit Drive.
2—CLEARFIELD #404, New 1954
2—CLEARFIELD #610 and #920.
1—BEARDSLEY & PIPER #60 SPEEDMULLER, 60 HP motor, SKIP-LOADER.
1—B & P #40 SPEEDMULLER.
1—B & P MULBARO, #7, extra Base

OVENS

1—FOUNDRY EQUIP. CO., 2 comp., rack, 12'-10" x 15'-8" x 7'-10"; oil, external recirculating
1—TOWER CORE OVEN, 14" x 60" trays, 45' high, gas fired, dismantled.
2—ROSS 2 comp., rack, gas, 6½ x 14 x 7.
1—PORBECK, 4 drawer, double end, oil.
1—YOUNG BROS. 3 compartment, kiln type electrically heated, with CONTROLS.
1—YOUNG BROS. 2 compartment, drawer type, oil or gas, 82" h x 12' w x 6' l.
1—YOUNG BROS. 3 door, gas, 12' x 8' x 6'-3", recirculating, blower & recorder.

SAND CUTTERS

5—AMERICAN SAND CUTTERS.
1—MODEL "AA", 60" reel, Gas Driven.
1—MODEL "K", 72" reel, Gas Driven.
1—MODEL "F", 80" reel, Gas Driven.
1—MODEL "D", 76" x 96".
1—SANDMASTER, 70/102, New in 1950, Rubber Tires.

SAND LABORATORY EQUIPMENT

1—Complete SAND LABORATORY
1—TEST CORE BAKING OVEN #606.

SAND PREPARATORS

2—B & P SCREENERATORS, size S & M.
1—NEWAYGO HANDY-SANDY
2—JEFFREY SANDITIONERS, Portable.
2—ROYER SAND BLENDERS, 16" belt, 12" belt.
1—LINK BELT REVIVIFIER, Size 5.
2—B & P SAND CONDITIONERS, portable.
1—HETHERINGTON & BERNER SAND DRYER, rotary, oil fired #552.

SAND SLINGERS

1—BEARDSLEY & PIPER MOTIVE JR. 19" head.
1—BEARDSLEY & PIPER STATIONARY, 19" head, 8 ton plate feeder and hopper, NEVER USED.
1—BEARDSLEY & PIPER TRACTOR TYPE 16" head, magnetic separator.
1—PORTABLE SLINGER, 16" head, 4' long, on Truck.

TESTING MACHINES

1—TINIUS OLSEN, UNIVERSAL, 100,000# capacity.
1—TINIUS OLSEN, BRINELL HARDNESS, 3,000 KG.
1—RIEHLE, UNIVERSAL, 2 screw mechanical, 100,000# capacity.
1—ROCKWELL HARDNESS, #5JR with "C" Brail.
1—BALDWIN - TATE - EMERY, UNIVERSAL, Hydraulic tensile, 24,000#.

TRUCKS

2—HOUGH PAYLOADERS, Model HA, Hydraulic Trip.
2—BELL PRIME MOVERS, 1000# capacity, gas driven.

MISCELLANEOUS

1—GARDNER VERTICAL DISC GRINDER
1—PATTERSON KELLEY DRY SAND BLENDER, Twin Shell, 3 cu. ft.
6—PENN DUMP BUCKETS, 1000# to 4 ton.
4—CURTISS AIR HOISTS, barrel type.
1—HOFFCO Vacuum Cleaner, #75.
1—ALLEN-BILLMEYER Vacuum Cleaner, port.

UNIVERSAL MACHINERY AND EQUIPMENT CO.

1630 N. Ninth St., Reading, Pa. **Phone 3-1927**
320 E. Broad St., Shillington, Pa. **Phone 7-1321**

$2,000,000 LIQUIDATION SALE

• ONE OF AMERICA'S MOST MODERN FOUNDRIES •
• ALL EQUIPMENT PURCHASED NEW 1949-1954 •
• EVERYTHING MUST BE SOLD IN 60 DAYS •

AIR COMPRESSORS

1—**GARDNER-DENVER** 9 x 8 Type YB, 30 HP motor, S/N 73982, with Magnetic Compensator, Air Receiving Tank.
1—**GARDNER-DENVER** 9 x 9 Type R9CG, 40 HP Motor, S/N 88395 with Magnetic Compensator, Air Receiving Tank.
1—**INGERSOLL RAND** Model ES1, 14 x 13, 100 HP Motor, S/N 76711, with Magnetic Compensator, Air Receiver.

AIR HOISTS

30—**KELLERS,** 500, 1000 & 2000 cap.
6—**INGERSOLL RAND** Size C, 2000 lb.
6—**INGERSOLL RAND** Size D, 4000 lb.
3—**INGERSOLL RAND** Size D-6, 6000 lb.
3—**INGERSOLL RAND** Size E, 10,000 lb.

CORE ROOM SAND MULLERS

3—**SIMPSON** No. 1, 4 cu. ft. 10 HP Motor & Reducer, Dust Hood, automatic timing.
1—**BLYSTONE** Paddle Type Sand Mixer, 3 cu. yd. capacity, with 3 HP motor.

CORE OVENS

1—**BAKER** Single Compartment gas fired, recirculating, with L & N controls; I.D. 113" L, 48" W, 78" H.
6—**MAEHLER** Single Compartment, gas fired, recirculating, with L & N controls; I.D. 96" L, 80" W, 84" H.
2—**MAEHLER** Two Compartment, gas fired recirculating, with L & N controls; I.D. 78" L, 48" W, 84" H.
50—Assorted Core Racks for the above ovens, stationary and portable.

CORE ROLLOVER MACHINES—PORTABLE

10—**INTERNATIONAL** Type R, portable
4—**INTERNATIONAL** Type RP, Size 24 x 10.
3—**INTERNATIONAL** Type GR, Size 30 x 12.
3—**INTERNATIONAL** Type RJ, Size 20 x 8.
3—**INTERNATIONAL** Type RJ, Size 16 x 6.

CORE ROOM BLOWERS & MISC.

3—**INTERNATIONAL** SB-11 Core Blowers.
2—**CLIMAX** No. 2A Wire Straighteners.
25,000 lb. of Aluminum Core Plates.
12—**ROSS** Single Unit Core Drawers.
6—**ROSS** Double Core Drawers.
3—Core Stripping Machines.
1—**STONEY** Core Grinder, 16" wheel, 48" travel.

CONVEYOR BELTING

600' **HEWITT-ROBINS,** 24" wide, 4 ply, 32 oz. duct, 3/16" x 1/32" rubber cover, one roll NEVER USED.
400' **HEWITT-ROBINS** Elevator Belt 18" W., 8 ply, 35 oz. 3/32" x 1/16" top. NEVER USED.
500' Various Sizes in shorter lengths.

CLEANING & TRIMMING EQUIPMENT

3—**MOTT** Sand Blast Barrels, Type ES1.
2—**MOTT** Hand Cleaning Cabinets.
2—**MOTT** Sand Blast Rooms.
5—**L'HOMMEDIAU** Polishing Lathes No. 20-B double wheel, with 10 HP.
3—**CRESCENT** Metal Cutting Band Saws, 36" throat, 5 HP motor.
2—**DEWALT** Model ME2 Metal Cutting foundry type Radial Cut-off Saws, 10 HP.

OVERHEAD SAND SYSTEMS

New 1954—Cap. 60 ton per Hr.
2—**SIMPSON** #3 Unit Drive Intensive Mixers. Plain Wearplate. 2200 lb. Mullers. Sand Sampler, 40 HP Motors, Dust Hoods, Timers.
Inclined Return Sand Conveyor, 24" x 46', with Dings Magnetic Pulley, M.G. Set.
Return Sand Bucket Elevator, 18" x 42'.
Belt Conveyor Under Screen, 24" x 12'.
Belt Conveyor Over Sand Bin, 24" x 19'.
SIMPLICITY 6' x 10' Shakeout, Model M-11.
JEFFREY Electric Vibrating Feeder, Stationary Hopper, 42" x 10'.
SIMPLICITY 36" x 96" Model DII Vibrating Feeder.
SIMPLICITY 48" x 120" Model M9 Vibrating Single Deck, simpli-flo screen.
Overhead Sand Storage Bin, 120 Ton Cap.
Belt Conveyor Under Sand Muller, 24" x 19'.
Inclined Belt Conveyor to Aerator, 24" x 78'.
Molders Overhead Conveyor, 24" x 140'.
Spill Sand Return Conveyor, 24" x 132'.
Return Sand Belt Conveyor, 24" x 44'.
Apron Conveyor under Sand Bin Palmer "B," 36" x 48".
Aerator Unit, 5 HP GE Motor.
Sand Slinger Belt Conveyor, 18" x 8'.
#12 Wt. **ROTOCLONE** with 25 HP GE Motor.
Mold Car and Bottom Board Extruder.
Mold Transfer Craneway.
BEARDSLEY & PIPER Super Hydra-Slinger 6' First Arm, 4' Ramming Unit, 19" Dia. Impellor Head, 2 speed, 27/40 HP Motor, with Hydraulic Controls Motor Crane Bridge.
BEARDSLEY & PIPER Model 1020-RC, J & J Rol-A-Draw, Cap. 3500 lb.
BEARDSLEY & PIPER 16', 9¼" Dia. Rotomold, 4 station, Air Indexed, Counter Clockwise Rotation.
New 1949—Cap. 60 ton per Hr.
2—**SIMPSON** #3 Unit Drive Intensive Mixers, 2200 lb. Mullers, S.D. Air Operated, Plain Wearplate Crib Liner, complete with 40 HP Motors, Starters, and Dust Hoods.
Return Sand Conveyor, 24" x 37', 18" Dia. x 24" Belt, Dings High Intensity Magnetic Pulley.
Return Sand Bucket Elevator, 18" x 46'.
ROBINS Conveyor, Style "M" Vibrex Screen, 48" x 120", double Deck.
Storage Bin Belt, 24" x 22'.
Return Sand Spill Belt, 24" x 135'.
Return Sand Incline Belt, 24" x 20'.
Feeder Apron Conveyor—WEBSTER, 36" x 20'.
Conditioned Sand Conveyor, 24" x 17'.
Conditioned Sand Bucket Elevator, 18" x 37'.
Overhead Storage Bin, 120 ton cap.
Aerator, 5 HP GE Motor.
Aerator Conveyor, 24" x 10'.
Distributing Sand Conveyor, 24" x 156'.
WEBSTER Apron Casting Conveyor, 36" x 54'.
ROBINS Vibra-Veyor, 36" x 164', handles Shakeout Sand and Castings.
23 Hoppers with Branford Air Operated Vibrators.
#F-5 **SYNTRON** Feeder Conveyor, with FC Controller, 30" wide x 78" long.
Type N #12 **ROTOCLONE,** 25 HP Motor.
GRATINGS AND TREADS
Approx. 900' **MATHEWS** 18" Heavy Duty Roller Conveyor, 2-9/16" Rollers, 11/16" Shaft, on 4" Centers and 4" Channel.

CORE KNOCKOUT SYSTEM

New 1954—Consisting of:
24" x 60' Horiz. Belt under Shakeout.
SIMPLICITY 3' x 8' Shakeout.
Incline Belt 24" x 105' Belt 18" x 24", Dings Magnetic Pulley, MG Set.
JEFFREY 24" x 20" Double Roll Core Crusher, with 15 HP GE Motor.
Overhead Storage Bin, 25-ton cap.

CRANES & RUNWAYS

1—**SHAW-BOX** 3-ton Crane with powerized trolley, mounted on 20' bridge, power travel, including 150' of I-beam runway. Floor operated.
1—**YALE & TOWNE** 5-ton Electric Hoist with power trolley and 25' span Bridge, powerized, including 50' of I-beam runway. Floor operated.
1—**COMET** 1-ton Hoist, floor operated.
1—**YALE & TOWNE** 1-ton Electric Hoist.

HEAT TREAT FURNACES

1—**INDUSTRIAL** Normalizing Car Type Gas Fired, recirculating with L & N controls; I.D. 7' L, 8' H, 8' W.
5—**INDUSTRIAL** Type ES Car Type Gas Fired, single compartment, I.D. 57" L, 48" W, 57" H. to 960° F., with L & N Potentiometers and all controls.

MELTING FURNACES

25—**LINDBERG-FISHER** Type ATC No. 450 Crucible Stat. oil fired.
3—**LINDBERG-FISHER** No. 1000 Crucible Stationary, oil and gas fired.
3—**MONARCH** Reverberatory 2000 lb. cap. Hand Tilt Oil and Gas Fired.

MOLDING MACHINES

15—**INTERNATIONAL** Model LJS Jolt Squeezers, 10" squeeze cyl., stationary.
4—**INTERNATIONAL** Type PKL Jolt Squeeze Pin Lift, Size 14 x 5½.
3—**INTERNATIONAL** Type PKL Jolt Squeeze Pin Lift, Size 12 x 5½.
2—**INTERNATIONAL** Type RES Jolt Squeeze Rollover Draw Machines, Size 14 x 6.
4—**INTERNATIONAL** Type F Jolt Rock-over Pattern Draw Machines, Size 25 x 8.
4—**INTERNATIONAL** Type JDP Jolt Pin Lift Machines, Size 600 lb. x 8".
3—**INTERNATIONAL** Type GS Jolt Roll-over Pattern Draw Machines Size 24 x 7.
2—**INTERNATIONAL** Type G Jolt Roll-over Pattern Draw Machines, Size 24 x 10.

ROLLER CONVEYOR

1000' **MATHEWS** 18" Conveyor, $2\frac{9}{16}$" Dia., $1\frac{1}{16}$" shaft, on 4" centers.
800' **MATHEWS** 24" Conveyor, $2\frac{9}{16}$" dia. rollers, $1\frac{1}{16}$" shaft on 4" centers.
400' **MATHEWS** 12" Conveyor, $2\frac{9}{16}$" dia., $1\frac{1}{16}$" shaft on 4" centers.

TRAMRAIL SYSTEMS

5—**AMERICAN,** consisting of 75' long runways, with nine 20' span bridges, rated capacities from one-ton to 5-ton.
1—**AMERICAN,** consisting of 200' of Tramrail and two 12' bridges with trolleys; hand operated, 1-ton capacity.
1—**AMERICAN,** consisting of 225' of 10" I-beam runways, with 3 bridges 30' span, 3 ton cap.

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83—**INGERSOLL-RAND** RC-5 Air Bloc Type Air Hoists, 500 lb. cap.
25—**INGERSOLL-RAND** Air Hoists, Sizes A, B, C, D, D-6 and E, 500 to 10,000 lb.
5—**CHICAGO-PNEUMATIC** 2-3-5 ton cap.
8—**DETROIT,** 1 to 5 ton cap. Air Hoists.

CORE BLOWERS

1—#4 **DEMMLER**—#2 **DEMMLER.**
2—#92 **OSBORN**—#91 **OSBORN.**
2—#193 **OSBORN**—#192 **OSBORN.**
2—CB-400 **CHAMPIONS.** #1 **DEMMLER.**
6—**MILWAUKEE**—Taccone Model A-3.

CUT-OFF SAWS & STRAIGHTENERS

1—**TABOR C10AF**—16" Wheel, 10 HP.
1—**DEWALT** Model Me2V Foundry Type Cut-Off Saw with 10 HP motor.
2—**CLIMAX** #2, 3 Wire Straighteners.
2—**TESSMER** "H" & "I" Sprue Cutters.

CORE OVENS

1—**ROSS,** 2 Compartment, car type, overall 14' L x 14' W x 7' H. Oil fired.
1—**INDUCTION HEATING** Dialectric Model M-800A, 600 lbs. per hour 300 hrs. use.
1—**INDUSTRIAL** Continuous Type, trays 18" x 80" long, gas fired recirculating.
1—**DETROIT** Vertical Tower 45' high, racks 14" w x 60" long, 31". Centers.
1—**H. M. WHITE** 2 Compartment, drawer type. Size 15' x 12' x 8'—Gas fired, all controls.

CUPOLA BLOWERS

1—**ROOTS-CONNERSVILLE,** size 20 x 24, Type HD w/50 HP motor, etc. 7½ HP.
1—**INGERSOLL-RAND** Centrifugal Type FS-367 with 100 HP motor.
1—**INGERSOLL-RAND** Type FS-357, 7000 CFM w/60 HP motor.

DUST COLLECTORS & ROTO-CLONES

1—**PANGBORN** #423 CH, Bag Type Dust Collector. 3240 CFM.
1—**AMERICAN AIR FILTER** No. 14 Type W arrangement "C" with sludge ejector.
1—**AMERICAN AIR FILTER** No. 27 Type W arrangement "C," with sludge ejector.
1—**AMERICAN AIR FILTER** Type N. Size 10 with No. 14 Roto-Clone & sludge ejector. Grinding Bench type.
1—**AMERICAN AIR FILTER** Type N. Size 20, 20 000 CFM, with 75 HP motor.
1—**AMERICAN AIR FILTER** Type N, Size 24, 24,000 CFM, 75 HP motor.

ELECTRIC MELTING FURNACES

5—**DETROIT** Type AA Rocking 750 to 1000 lbs. w/250 KVA Transformers.

GAS & OIL FIRED FURNACES

6—**LINDBERG-FISHER** MNP Size 1700
18—**LINDBERG-FISHER** Type SSH.
1—**LINDBERG-FISHER** MNP Size 1000.
3—**LINDBERG-FISHER** MNP Size 2400
1—**LINDBERG-FISHER** MNP Size 225
2—**LINDBERG-FISHER** Type BBI, #225 & #400 crucibles, hand tilt, complete.
11—**HAUSFELD** #200 Crucible, stationary.
1—**STROMAN** Model NP, 125-175 Crucible.
2—**CAMPBELL-HAUSFELD** IPNT Iron Pot Type, 2000#'s Cap. gas or oil.

GRINDERS—SWING—SNAGGING

2—**FOX** #5 High Speed Stand, wheel 24" x 3"—10 HP motor.
1—**HAMMOND WR-1** Double End Snag, wheel 24" x 3"—10 HP motor.
1—**U. S.** Electric Swing Frame, 15 HP, 2 speed, wheel 24" x 3" x 12".
6—**U. S. ELECTRIC** #65 Snag Grinder, 15 & 20 HP—4 speeds, wheel 24" x 3".
2—**U. S. ELECTRIC** #64 Snag Grinders, 7½ hp. adjustable speed, wheel 14" x 3".
1—**MARSCHKE** 3 HP Swing Grinder.

LADLES

6—**INDUSTRIAL** Lip Pour 24" x 24"
4—**MODERN** 1500 lb. Cylindrical Type.
1—**WHITING** 10 ton lip pour, enclosed gear.

INDUCTION MELTING—HEAT TREATING

1—**LEPEL** 30 KW Spark Gap Converter w/controls & 20 lb furnace & stand.
1—**LINDBERG** Model 4860 GH, Cyclone Type gas fired, with all controls.
1—**GENERAL ELECTRIC** 1250 kva Induction M.G. set 300 cycles, with 1850 HP
1—**GENERAL ELECTRIC** 300 KW Induction MG Set, 2520 cycles—450 HP.

NEVER USED

1—**B & P** Stationary Sand Slinger, Double Belt Model, 5' Arm, 4' Ramming Unit, 19" head, 4" tip.
1—**B & P** Johnston & Jennings Model 920-RCX, Rol-A-Draw.
1—**B & P** 8 Ton Roto-Feed, 7' dia. Sand Bin, 8' Dia. Feeder Plate.
1—**LINK BELT** Bucket Elevator 30', bucket size 12" x 7" x 7¼" cap. 41 tons per hour.

MUST BE SOLD!

1—**LOFTUS ENGINEERING CORP.** Annealing Furnace, walking beam, gas fired, recirculating, 1600°, complete with all necessary controls, motors and blowers; equipped to handle 17 baskets 2' wide x 2' deep x 4' long, overall dimensions 45' long x 10' wide x 12' high. NEW 1951.
1—**WHITING** 5 ton Overhead Crane, 50' span, cab operated, AC 220/440 volt, 3 phase, 60 cycle, complete with 160' runway, including all necessary "A" framing; can be inspected in operation.
1—**SHEPARD NILES** Overhead Crane, 66½' span, 15 ton cap. 10 ton trolley with 5 ton auxiliary; electrical for 220 volt, 3 phase, 60 cycle; rebuilt 1954, with 350' of electrified runways; cab operated.

MOLDING MACHINES

Jolt Squeezers

2—**MILWAUKEE** #104—Table 17" x 20" Portable.
16—**OSBORN** #275J—Table 16" x 20"—Portable.
4—**OSBORN** #275 PJ—Table 17" x 20"—Stationary.
10—**SPO** #110J—Table 17" x 20"—Port.

JOLT ROLLOVER PATTERN DRAW

1—**DAVENPORT** #40SA—Table 42" x 50"—3000# Jolt, 18" Draw.
2—**HERMAN** 6000# Series, 42" x 78" Table, 20" Draw.
1—**INTERNATIONAL** Type G, Size 24" x 10".
1—**INTERNATIONAL** Type G, Size 30" x 12".
2—**JOHNSTON & JENNINGS** #815, Table 30" x 40", Draw 15". 1500# Jolt.
1—**MILWAUKEE** #167, Table 32" x 33", Draw 12", Jolt 1000#. Sq. cyl. 16".
1—**OSBORN** #342, Table 23" x 38", 10" Draw, 1000# Jolt.
2—**OSBORN** #405, Table 57" x 64", Draw 26", 3000# Jolt.
1—**SPO #413-D,** Table 24" x 25", Draw 10", Jolt 600#. Sq. cyl. 13".
1—**SPO** #508, Table 28" x 30", Draw 9", Jolt 1200#.
2—**TABOR,** 22" x 32" Table, 10" Draw, 600# Jolt Port.
1—**TABOR** 30" x 40" Table, 12" Draw, 1000# Jolt.

JOLT SQUEEZE PIN LIFT

1—**INTERNATIONAL** Type PKL, Size 12" x 5½".
1—**MILWAUKEE** 125-3, Table 21" x 27", Jolt 1200# Draw 8".
1—**MILWAUKEE** #163.
2—**OSBORN** 710J, Table 16" x 25" Draw 6", Sq. cyl. 10".
4—**OSBORN** 716PJ, Table 22" x 34", Draw 7", Sq. cyl. 16".

JOLT PIN LIFT

1—**DAVENPORT** 40 AJS, Draw 18".
1—**INTERNATIONAL** JDP Size 600 x 8".
1—**INTERNATIONAL** LP-10, Table 30" x 30", Draw 10".
1—**MILWAUKEE** #1536, Table 32" x 38", Draw 12".
3—**OSBORN** 559, Table 25" x 30", Draw 6", Jolt 1200#.
1—**OSBORN** 563-9, Table 55" x 63", Draw 12", Jolt 7000#.

MATERIAL HANDLING EQUIPMENT

1—**FARQUHAR** 18" x 35' portable Trough.
1—**LINK-BELT** Overhead Conveyor, 100' track, chain, trolleys, curved, motorized.
1—**ELECTRIC BRIDGE** Crane, 25' span, with 2 ton R & M Hoist, 150' track.
1—**JEFFREY** Trough Belt Conveyor, 75' centers, belt 24", with motor drive.
1—**JEFFREY** Trough Belt Conveyor, 103' centers, 24" wide, motor & drive.
3—**LOUDEN MONORAIL SYSTEMS,** "Super Track" (1) 110' of 6" I-beam & two 20' bridges (2) 140' of 6" I-beam & two 12' bridges (3) 130' of 11" I-beam & two 30' bridges; all complete.
1—**SIMPLICITY** Model OA-10-JA—24" x 16' long Vibrating Conveyor.
1—**JEFFREY** 24" x 117' Steel Apron Conveyor.

SAND MULLERS

BEARDSLEY & PIPER
1—#30 w/Skip Hoist & Dust Hood, 20 HP.
1—#50 w/Skip Hoist, Dust Hood, 50 HP.
1—#70 w/Dust Hood—100 HP motor.
CLEARFIELD
1—#404 Batch 4 Cu. Ft.
1—#610 Batch 10 to 14 Cu. Ft.
1—#930 Batch 30 to 40 Cu. Ft. 9' Pan—60 HP.
SIMPSON
1—#1H, Style UD—500# Batch.
1—#1 Style B, Single Wheel, 400# Batch.
1—#3 Style C, Enclosed Gears—3000#
1—**BLYSTONE** Paddle Type Mixer, 5 HP.

SAND PREPARATORS

1—**PEKAY** Aerator Model 320-3.
1—**B & P** #70 Portable
6—**B & P** Screenerators.
8—**ROYER** Sand Conditioners, all models, NC-2, NDP, C-2, etc., portable.
1—**B & P** #40 Portable.

SAND CUTTERS—BY "AMERICAN"

1—Model BD—Size 75/60.
1—Model M—Size 99/80.
1—Model M—Size 89/70.

SAND SLINGERS

1—**B & P** 19" Tractor Type, 13' arm.
1—**B & P** 16" Tractor Type, 13' arm, magnetic tower, 4' ramming 4" tip.

SHAKEOUTS & SCREENS

4—**SIMPLICITY** 4' x 8' Model D, 16,000#.
1—**ROYER** Combination Shakeout & Sand Conditioning unit, serial #ST-47.
4—**SIMPLICITY** 4' x 6' Model B, 5000#.
1—**SIMPLICITY** 4' x 10' Model D.
3—**SIMPLICITY** 3' x 6'—Model BG, 5000#.
1—**SIMPLICITY** 6' x 8' Model DE.

SHAKEOUTS

1—**HEWITT-ROBINS** 36" x 78" Uibrex Screen Style M-7.

TUMBLING BARRELS

2—**SLY** 42" x 72" Square, with 10 HP Gearhead motor—magnetic brake.
1—**SLY** 36" x 72" Type C, 5 HP Gearhead Motor—magnetic brake.
4—**WHITING** 48" x 72", 10 HP Gearhead Motor—magnetic brake.

WHEELABRATORS & TABLAST

1—**AMERICAN** 42" x 48" Tumblast, with skip hoist.
1—**AMERICAN** 27" x 36" Tumblast with skip hoist loader.
1—**PANGBORN** 6 LG-14 Rotoblast table 6', with (6) 24" tables, new 1952.
1—**PANGBORN** 6 LF Rotoblast Table, 6' Diam. w/dust collector.
1—**PANGBORN** Shot Blast Room 10' x 12' x 14' w/dust collector, elevator etc.

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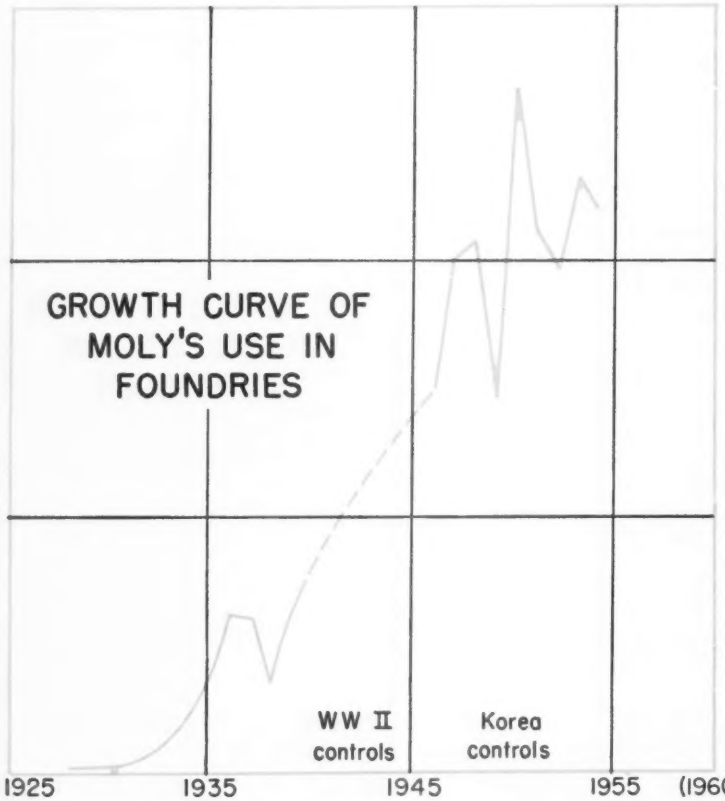

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Published monthly by

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Member: National Business Publications, Inc.; and Society of Business Magazine Editors. Copyright 1955 by THE PENTON PUBLISHING CO.

Second class mail privileges authorized at Cleveland, Ohio.

FOUNDRY *is indexed regularly by*
Engineering Index Inc.
29 West 39th St., New York 18.

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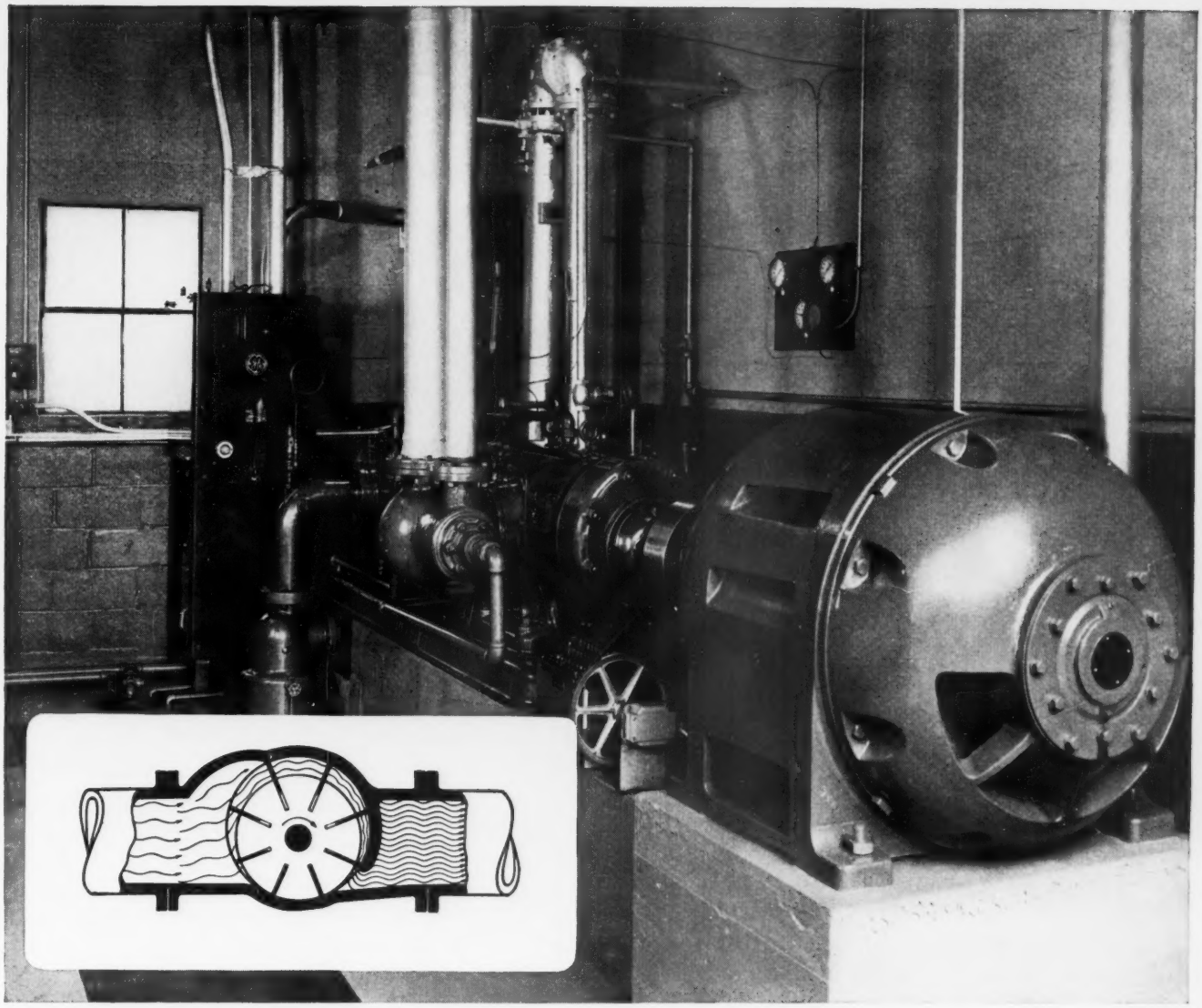

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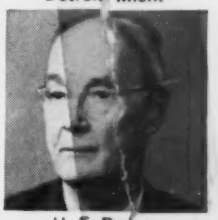
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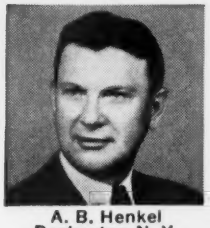
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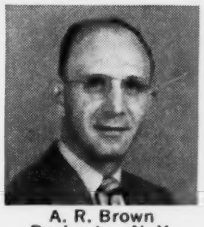
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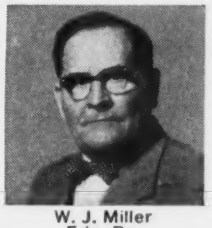
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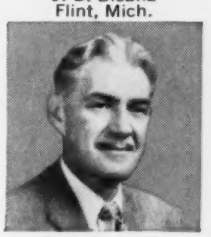
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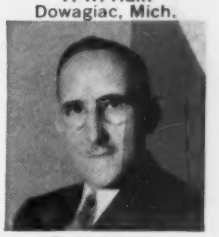
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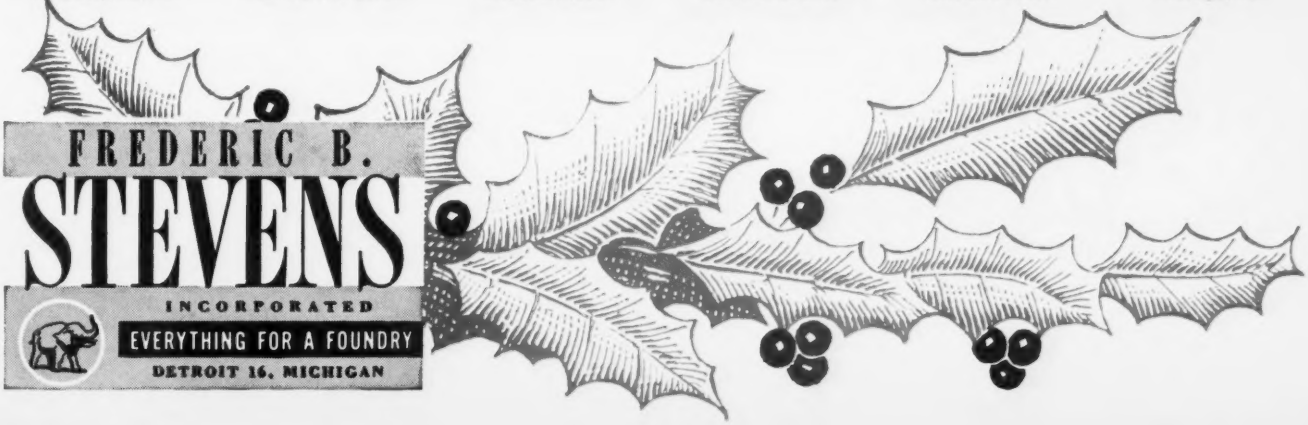

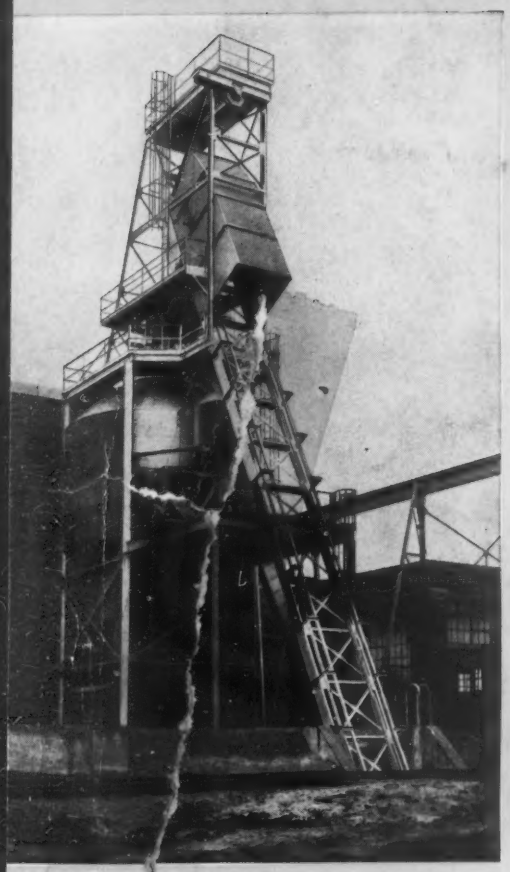

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1955

The Penton Publishing Company
Penton Building
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